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Another Bottle-neck

The lesson of Kingston

ELECTRICAL development has owed much to economies derived from the concentration of generating plant which began at the beginning of the century with the formation of power companies for giving bulk supplies. Apart from questions of lower production costs and, what is becoming of increasing importance, of keeping the physical dimensions of plant for a given aggregate output within practicable limits, this policy ought to make for greater reliability, since local generating plant, if badly damaged, might be out of commission for a long period, whereas a defect in a transmission system can quickly be repaired.

Reliability of individual pieces of electrical apparatus of all kinds is immensely greater than it ever was—proportionately more than is necessary to meet the much greater severity of conditions of its use. Yet the public has of late been genuinely disturbed by an apparent increase in the number and length of interruptions in supply. These it is apt, fallaciously, to attribute to a policy of "putting all the eggs into one basket," as it regards the elimination from normal operation of the smaller stations—unmindful, or ignorant of, the many occasions on which the bulk supply has kept the distributors alive during the failure of a local station. The public view is due partly, no doubt, to the very much more serious effect on a far greater number of people of any electrical shortcomings nowadays and hence to the greater attention they attract.

Unavailable Reserves

Some recent breakdowns, however, have a deeper significance and strike at the very root of present ideas about giving supplies of any magnitude. It is of little use having plant and transmission systems which are themselves of a high degree of reliability, if they stand by impotently while a local defect causes thousands of people to be deprived of electricity and a widespread stoppage of industry.

It is a cardinal principle in the design of protective gear that its primary purpose is to safeguard not the component protected but the rest of the system, cutting out the faulty member in order that the whole may not suffer. So far as the electrical means are adequate this can be done, but if physical segregation is not properly carried out, other plant becomes involved in, for example, a resulting fire.

Engineers claim, rightly, to learn from breakdowns. The lesson of the Bradford trouble of nearly three years ago has not been lost sight of. It intensified a trend towards the physical separation of plant items which had been put into practice already in more modern stations, where it has proved its value in cases which have fortunately not affected consumers appreciably. Nevertheless, is the principle being carried far enough?

A state of affairs not unlike that at Bradford caused a prolonged shut-down in the Thames Valley last week, regarding which the Electricity Commissioners have very properly instituted an official inquiry. That a human error should have destroyed a switch is one thing; that this should have caused the oil from an adjacent transformer to take fire and to result in serious damage to Kingston generating station is another. Neither of these, however, is the aspect upon which attention should be mainly focused. The chief point is that the supply not only to the Corporation's consumers but also to the J.E.A. areas was cut off or curtailed for long periods. It should have been kept going by the alternative supply that was available in duplicate from the grid, and could have been if all supplies had not had to pass through a bottle-neck of switchgear at a point where fire broke out.

Good Work

Thanks to the strenuous endeavours of Mr. E. J. Jarvis, Mr. F. W. Purse and the staffs of the Kingston Electricity Department and the London and Home Counties Joint Electricity Authority, and also to the neighbourly help rendered by the Central Electricity Board and other undertakings, normal conditions were restored more quickly than might reasonably have been expected in the circumstances, especially in view of the foggy weather. Efforts on this scale should not, however, have been called for if the J.E.A. network had had another point of connection with the source of its supply.

Provision is made in the grid tariff for tapping at more than one point and appropriate arrangements are being made in some large areas for this to be done, as a measure of national defence, at points remote from generating stations. The cost of extending the principle to bulk supplies everywhere would no doubt be heavy, but no time should be lost in working out a provisional scheme of this nature and in carrying it out wherever practicable in the interests of continuity of supply in a national emergency.

Birmingham's Film Enterprise

THE E.D.A. films which are now available to supply authorities are designed for selected audiences in any part of the country. While they could conceivably be included in the ordinary public cinema programme they were not produced with this in view and would not ordinarily be accepted by exhibitors. The film made at Birmingham by the Corporation Electric Supply Department is in another category. It is as much a propaganda film as E.D.A.'s and compares very well with them. But its appeal in its present form is purely local and yet that limitation actually adds to its effectiveness. People like to see pictures of local activities; the film is thus good "box office" and consequently acceptable to cinema managers. Once it has gone the round of the cinemas—sixty-three of them—its "public" life is finished, but it is being reproduced in the 16 mm. size for further use by the Department. This method of propaganda is not cheap but it certainly gets home, and it would pay other large undertakings, or groups of undertakings, to follow Birmingham's example.

Manchester Transport

THE Manchester General and Parliamentary Committee is to consider at its next meeting the final recommendations of the special sub-committee appointed to report upon the Transport Committee's proposals to abandon trams in favour of oil-engined buses. According to the *Manchester Guardian*, it has been stated "unofficially" that, subject to minor modifications, the special sub-committee will recommend the adoption of the Transport Committee's proposals. Until the extent of the "minor modifications" is known it is not possible to weigh up the position, but if our contemporary's informant was correct all arguments and persuasion in favour of the trolley-bus have been in vain. But the fight to secure the replacement of electric vehicles by electric vehicles will continue. There is a strong body of opinion in Manchester in favour of trolley-buses which has not been convinced by the arguments put forward by the other side. There is also the national point of view to be considered: whether it is desirable that a system the size of Manchester's should be dependent upon imported fuel rather than home-produced coal.

Export Trade Conditions

ALTHOUGH the year that is nearing its close has been for the electrical industry, in common with others, a singularly difficult period so far as overseas trade is concerned the success achieved has been in marked contrast with the general decline in exports since the first month of the year. Some of the larger orders were, of course, placed before the beginning of the year and the results may not therefore indicate the true state of overseas trade during the year. Nevertheless, it is notable that, compared with the lower level of exports generally, electrical exports have in no month fallen below last year's figures, and the aggregate up to the end of November of £19,800,000 exceeded that for the whole of last year (£18,500,000) and also the 1929 peak year (£19,500,000). In a measure, no doubt, this has been due to the expanding electrical requirements of overseas countries, but the rise also, we believe, reflects a more energetic policy on the part of manufacturers. It was the realisation of the need for this, Mr. Frank Parkinson told the shareholders of Crompton Parkinson last Friday, that prompted the company to strengthen its sales forces in several countries, and probably on this account the company is able to report a good flow of orders from overseas. The chairmen's speeches at last week's meetings of Broom and Wade, Ltd., and R. A. Lister and Co., also laid stress on efforts to retain and expand overseas markets. These factors, coupled with the more favourable outlook generally to which Sir John Simon referred last week, should enable the present high rate of electrical exports to be substantially maintained.

Recovery from Shock

WHEN a man loses consciousness as a result of electric shock no time at all should be lost in applying artificial respiration, and the effort should not be slackened until life is known beyond a doubt to be extinct. Proof that the importance of these two points is not universally realised reaches us too often and we therefore make a point of emphasising it whenever occasion arises. Investigations carried out under the direction of the Harvard Medical School, and reported in the *National Safety Bulletin* showed that 70 per cent. of the victims recovered if resuscitation was begun within three minutes. Even one minute's delay beyond this period caused the recovery rate to drop to 58 per cent. The necessity for prolonged artificial respiration is confirmed, the view being that unless *rigor mortis* sets in in the meantime one cannot be sure for twelve hours as to the prospects of recovery.

A Field for the Consultant

THOSE who are critical of the tardy way in which distribution voltages are being standardised should bear in mind, in fairness to engineers managing supply undertakings, that these are often exceedingly busy men. The ordinary running of the undertaking, including its proper development, occupies the time of the chief and his staff very fully, and the organisation and carrying out of a change-over is a whole time job for a large number of men. For such work it would very often pay to retain a consultant with an experienced staff, as Sir Cyril Hurcomb suggested at the dinner of the Association of Consulting Engineers. There is, however, a difficulty in following this excellent advice, as he clearly appreciated. While most supply engineers must be expected to regard a wish to obtain the assistance of a specialist as a sign of strength rather than of weakness, would their committees appreciate this? If the Association, within the limits of its admirable code of professional dealings, is able to educate public bodies in the advantage of using the extensive experience of the consulting engineer as well as the intensive experience of the local administrative engineer, its action would surely be in the public interest.

The Anglo-American Agreement

OUR first impression of the Anglo-American Trade Agreement was that, so far as the electrical trade was concerned, the balance was in favour of United States manufacturers. This impression is confirmed by the considered statement issued by B.E.A.M.A. this week, which shows that the British electrical manufacturing industry derives little of value. Nevertheless, as we remarked in introducing the Agreement in our issue of November 25th, the wider view must be taken and individual advantage subordinated to the general strengthening of relations between our two countries which is recognised as being essential in these troubled times. Other sections of British industry will benefit from the agreement. This will help to increase general industrial activity which may improve the electrical manufacturers' home market.

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Progress at Southampton

A rapidly growing industrial load

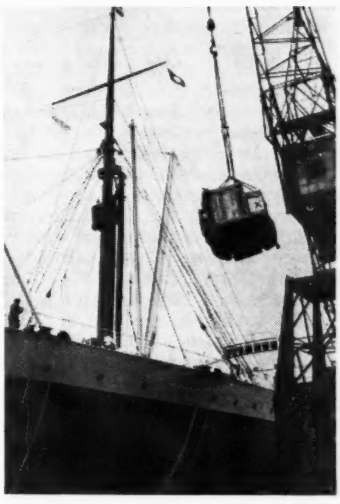
THE tendency of industry to come south is well known, but how many of our readers think of Southampton and district as a growing industrial area apart from being Britain's premier passenger port and the Empire air base? Yet there are now over seven hundred factories and workshops in the district (including the borough of Eastleigh)—nearly twice as many as ten years ago and the number is increasing rapidly year by year.

This state of affairs must in no small measure be attributed, of course, to the growing appreciation by manufacturers and industrialists that the more general use of electricity permits them to choose their factory sites in pleasanter, healthier and usually more convenient surroundings. Nevertheless, the Corporation Electricity Department (borough electrical engineer: Mr. W. G. Turner, M.I.E.E., A.M.I.Mech.E.) can claim a good share of the credit for encouraging the establishment of new industries in Southampton and district by its provision not only of reasonable tariffs but also of facilities for hire-purchase of electrical plant.

Small power consumers within the borough receive their supplies at 1d. per kWh for up to 10,000 kWh a quarter, the next 10,000 kWh at ¾d., and all over at ½d. per kWh; outside the borough the respective charges are 1¼d., 1¼d. and 1d. When the total consumption reaches 200,000 kWh a year the option is given of having a high-voltage supply on the maximum demand system. That full advantage is being taken of these reasonable rates can be judged by the fact that in ten years the annual consumption of electricity for power purposes alone has risen from 13¼ million to 41½ million kWh.

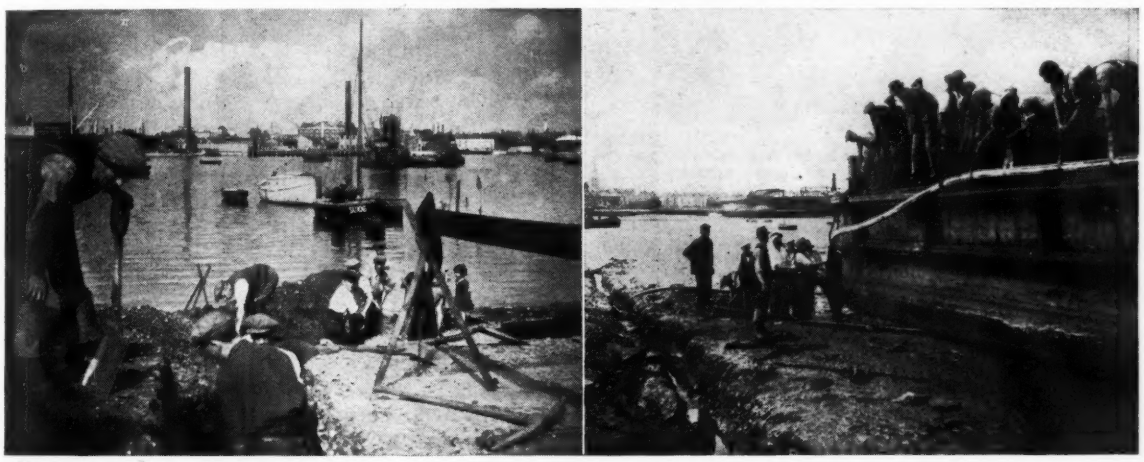
Since Southampton is primarily a seaport and air base it inevitably follows that its chief industries are those of shipbuilding and repairs, aircraft manufacture, and the numerous trades associated therewith. The docks, which are the property of the Southern Railway Company, are by far the Department's largest consumers, last year's total consumption amounting to nearly 11¾ million kWh, and the maximum demand to about 4,500 kW. Only part of this supply, which is taken in bulk, is required for the docks themselves, the remainder being passed on to the tenants of factories on the dock estate. Much of the supply to the docks is absorbed by numerous electric cranes but the largest individual load, though a very intermittent one, is provided by the pumps for the seven dry docks. Of these, the King George V Graving Dock opened in 1934 and measuring 1,200 ft. long, 135 ft. wide and 52 ft. deep, is the largest in the world, and requires four main pumps each driven by a 1,250-HP motor to empty its 58 million gallons (260,000 tons) of water in under four hours.

Most important of the consumers on the dock estate are Harland & Wolff's ship repairing works, the International Cold Storage & Ice Co.'s refrigeration installation, and Joseph Rank's flour mills, and there are also several smaller engineering works, cold storage plants as well as fruit importing and bottling and jam making factories, coal importers and saw mills. When we visited the docks a few days ago the most recent addition to the dock industries was just having its electricity supply switched on. This is the General Motors automobile assembling works which will provide a load of about 1,000 kW. A remarkable feature of the new building is its phenomenally high-intensity lighting, some three hundred 400-W "Osira" electric discharge lamps giving no less than 50 ft.-candles on the working plane throughout the factory. The supply to the docks and its factory estate, which together extend over an area of over 650 acres, is given *via* three sub-stations.



[Elec. Rev. photo.
Much of the electricity supplied to the Docks is used by electric cranes

Apart from the docks the Department's most valued consumer is Pirelli-General Cable Works, Ltd., whose factories at Eastleigh and Southampton take many million kWh a year. Originally, all the company's cables were made at Southampton, but in 1928 the increasing demand for power cable and super-tension cable led to the erection of a new factory at Eastleigh, where now the rolling mills, wire drawing and tinning shops for making copper wires and strips are situated, and where paper-insulated cables (including the super-tension oil-filled type) and telephone cables are produced. It is at this factory that a continuous lead extruding machine has been developed which constitutes one of the most important technical achievements of recent times in the cable-making industry. The machine is continuous in operation and thus prevents the inclusion of oxide films and consequent defective welds in the lead walls of the piping. Four of these machines are now in regular operation.



Left: Preparing the trench for laying a 33-kV cable across the harbour, the dredger with barge alongside waiting to bring the cable ashore. Right: The last piece of cable being hauled ashore

Additional space was thus made available at the Southampton works for the manufacture of rubber-insulated cable, flexible cords and covered wires for winding and instrument work, and in the last few years the factory has been successively enlarged. An extension of 80,000 sq. ft. just completed raises the total floor area to 425,000 sq. ft. As a result of this latest addition the productive capacity of the whole works has been increased from 20 to 50 per cent. for various types of cable. The new extension is situated on land reclaimed from Southampton Water and consists of a single-storey steel-frame building equipped particularly for the manufacture of standard types of wiring cables from 0.001 sq. in. to 0.01 sq. in., and also for various types of special cables as well as tough-rubber-sheathed cables up to 4 in. in diam.

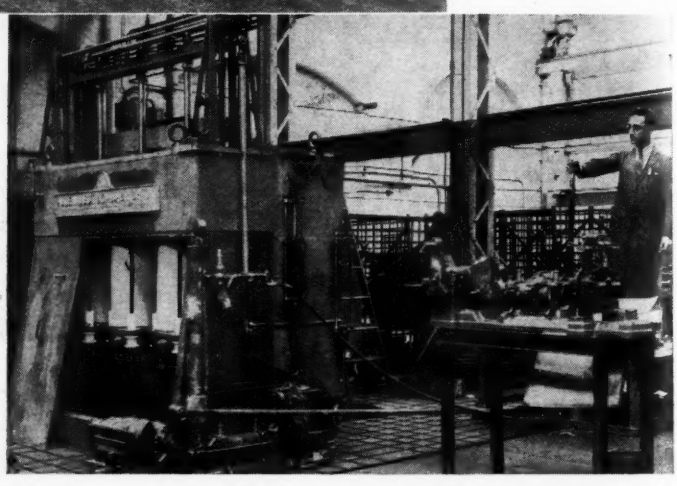
Another important electrical manufacturer accounts for some half-million kWh a year. This is Allen West & Co., Ltd., whose factory forms a conspicuous landmark. Taken over from the War Office in 1930, this huge building is used for the company's heavier manufactures, including liquid controller equipments for collieries, overhead line switchgear, lifting magnets, traction gear, metal-clad switchgear and a wide range of oil-immersed control gear for industrial appli-

cations. The factory gives employment to approximately five hundred people, in addition to the fifteen hundred employés at the company's Brighton factories.

Being the Empire Air Base, linking Great Britain with the Empire by 30,000 miles of routes, Southampton and district has become a centre for the production of aircraft and accessories, and Vickers-Armstrongs, Ltd. (Supermarine Works), makers of the winning seaplanes in the last Schneider Trophy contest, are just completing a new factory close to their old works at Woolston. Clustered round the Municipal Airport, too, is a growing colony of aircraft manufacturers including Vickers-Armstrongs, Ltd., Cunliffe-Owen Aircraft, Ltd., the Foster Wikner Aircraft Co., Ltd., Kay Gyroplanes, Ltd., Saunders-Roe, Ltd., and Oddie, Bradbury & Cull, Ltd.

The airport, by the way, is claimed to have the most up-to-date complete night lighting equipment of its kind in the country. Installed in 1935 at a cost of £3,500, it comprises three 1¼-million candle-power floodlights, a red neon identification beacon flashing the letters "SN" in morse code, an illuminated wind indicator, boundary lights and obstruction lights. There are also at Hamble the works and premises of Sir W. G. Armstrong Whitworth Aircraft, Ltd., Folland Aircraft, Ltd., and Air Service Training, Ltd.

Among the other factories we passed when Mr. W. P. Conly, the Corporation's consumers' engineer, showed us round a part of the Electricity Department's forty-four sq. mile area, which incidentally has a population of about 220,000, were those of the Limmer & Trinidad Lake Asphalt Co., Ltd., Sir Joseph Causton & Sons, Ltd., printers; the Southern Railway Co.'s locomotive and carriage works at Eastleigh and railway crossing and sleeper works at Redbridge; Toogood & Sons, Ltd., seed merchants; the British Oxygen Co., Ltd.; T. Wall & Sons, Ltd.'s, ice cream depôt; the Ministry of Labour's instructional centre; the Weir Precision Engineering Co., Ltd.; the Solent Carpet Co., Ltd.; the Sunlight Dye Works & Laundry, Ltd.; the British-American Tobacco Co., Ltd.; Auguste Pellerin, Ltd., margarine manufacturers; Birmal Boats, shipbuilders; Gough's Ice & Cold Storage Co., Ltd.; Parsons Engineering Co., Ltd., and Southern Newspapers, Ltd.; which, incidentally, besides employing electric melting pots on its linotype machines, has converted its casting plant to electric heating.



Above: Wire stranding machines in the new extension of the Pirelli-General works at Southampton. Right: Testing a liquid controller for colliery work at Allen West & Co.'s factory *[Elec. Rev. photos.*

The electricity undertaking also numbers among its consumers factories for making acetylene, bedding, beer, dairy produce, lead, chemicals, oil cakes, paint, pickles, scent, and seed crushing plant, as well as engineering, joinery, steel joist and timber works; the Ordnance Survey map-making office; an ice rink and a greyhound racing track, not forgetting the Corporation's own tramway system. Furthermore bulk supplies are given to the West Hampshire Electricity Co., Ltd., and Winchester Corporation, amounting last year to 5 million kWh.

Satisfactory though the growth of industry has been, there is still considerable scope for further development. In the construction of the new docks, hundreds of acres of mudlands have been reclaimed in the former West Bay, offering valuable sites for new factories, adjacent to deep water docks, railways and roads, and with an abundant supply of cheap electricity already available.

While perhaps it may be said that the Department has to a certain extent concentrated its attention primarily on development of the industrial load, this does not mean that other classes of consumers have been neglected. Domestic consumers in the borough are offered a two-part tariff which is one of the lowest in the country, there being a standing charge per room per quarter of 1s. 6d. in the summer and 3s. in the winter with a "unit" charge of ½d.; outside the borough the respective charges are 2s., 4s., and ¾d.

It is largely due to the popularity of this tariff, the annual sales under which have increased from 18,174 kWh to nearly 12 million kWh in the last ten years, that the number of domestic consumers has risen in the same period from 10,278 to 47,604. Consumption under an alternative flat-rate tariff for heating and cooking (¾d. per kWh in the borough, 1d. outside) has advanced from 3½ million to 10¼ million kWh, while lighting supplies which are paid for at 3d. (4d.) per kWh for the first 20,000 kWh, all over 20,000 at 2½d. (3½d.), and evening advertising at 2d. (2½d.), accounted for over 12 million kWh last year, compared with 5¼ million kWh in 1927-28. Assistance in wiring installation is given by means of a hired wiring scheme, under which consumers pay, through prepayment meters, 2d. extra per kWh for all energy used for lighting. At September 30th 18,055 out of a total of 50,106 domestic consumers were taking advantage of this scheme.

Facilities provided for hiring domestic appliances include free fixing and wiring up to 30 ft. Cookers, each with an automatic kettle, can be obtained in five sizes at from 4s. 6d. to 9s. per quarter, wash boilers at 2s. 11d., and thermostatically controlled storage water heaters at from 2s. 11d. to 5s. 11d. A wide range of apparatus is also supplied on hire-purchase terms spread over two or three years. At September 30th the number of domestic appliances installed on hire or hire-purchase included 4,010 cookers (187 increase during the quarter), 750 wash boilers (53 increase), 2,110 self-contained water heaters (142 increase), and 318 immersion heaters and circulators (49 increase). In connection with the supply of domestic apparatus a well-equipped large new repair department has just been opened on a site adjoining the undertaking's original power station (now a rotary convertor sub-station) in Back-of-the-Walls.

As a separate section of the same building, there is a large meter shop capable of dealing with the whole of the Departments meter requirements as provided for under the Meters Act. Everything here has been planned for the automatic progress of the work. The meters are dealt with in batches of either eighteen quarterly or twelve prepayment instruments, twelve trucks holding just these numbers being available. In the stockrooms rows of racks are clearly labelled "Ready for repair," "Available for test," and "Certified stock," each rack having sections allocated to different types of meter. Each member of the staff is responsible for compiling a section of the statistics and consequently it is possible at any time to obtain details of the number of meters avail-

able for use or still to be dealt with. Calibration and dial tests are carried out on neat panels constructed by the Department's own staff.

To encourage new applications of electricity in the home and to help consumers to use their apparatus correctly, twice-weekly demonstrations are given at the company's showrooms at Southampton and Eastleigh. From time to time other special demonstrations and exhibitions are given, a stand being taken regularly each year at the Southampton Industries and Trades Fair.

Considerable progress has been made in the undertaking's rural areas, which include the parishes of Botley, Bursledon, Chilworth, Hamble, Hedge End, Hound, Millbrook and West End. Sixteen villages are now directly supplied and from the agricultural point of view, particular interest is being taken in the heating of greenhouses and soil sterilisation. Numbered among the consumers are twenty-six farms with an average load of 5½ kW.

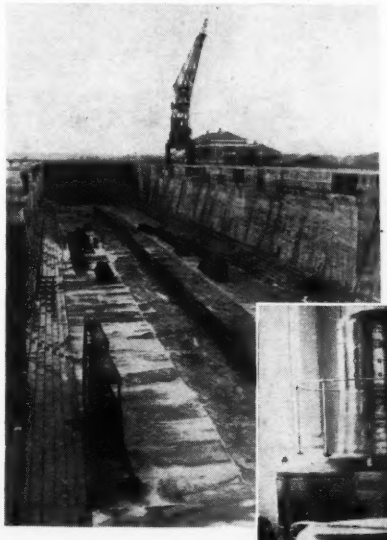
The Southampton Corporation sets its consumers a very good example by its own use of electricity. The whole of the street lamps within the borough and many outside are electric, there being altogether about 6,650 lamps installed including many electric discharge lamps. In the Civic Centre, too, there is a large all-electric kitchen equipped with roasting and steaming ovens, hot-cupboards, grillers, a bain marie, water heaters, egg poachers, toasters, heated food trolleys and service lifts. A new system of automatic control is just being installed at the fire station, while 4-HP Gent air-raid warning syrens are being provided at sub-stations. The number of public buildings served by the electricity undertaking has increased in the past ten years from 300 to about 650, shops and business premises connected now being approximately 5,200—some 1,900 more than in 1928.

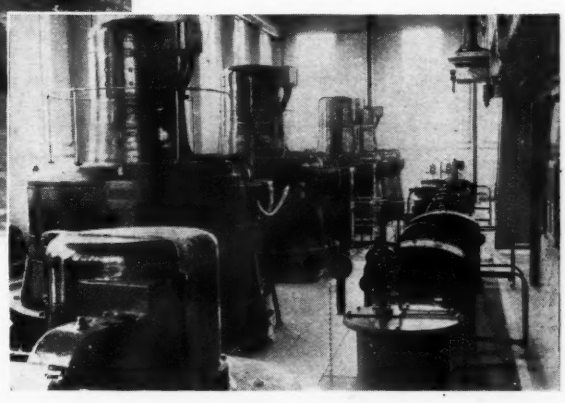
As a result of its enterprise during the past ten years the Electricity Department is to be congratulated on having increased the number of its consumers from about 14,283 at March 31st, 1928, to 56,033 and its annual sales of electricity from 26½ million kWh to 87½ million kWh. The total connected load is 204,039 kW, of which domestic users account for 92,000 kW, the maximum load so far being 34,470 kW. The average price received for electricity has been reduced from 1.942d. in 1927-28 to 1.133d. in 1937-38 (excluding bulk supplies, 1.162d.).

To date capital expenditure on the undertaking, after making deductions for plant superseded and written off, is £2,489,591. Last year the Department, having made a net profit of £47,152, contributed £12,300, amounting to 2d. in the pound, towards the general rate, this bringing the total contribution to £121,300. Moreover, to ease the burden of increased charges for electricity due to increases in the cost of coal to consumers taking bulk supplies, an alteration was made in the adjustment for variations in the cost of coal.

Expenditure for the year ended March 31st, 1938, for generation of electricity on behalf of and payable by the Central Electricity Board, was £289,746, as compared with £199,937 for the preceding year. With regard to the local undertaking, the total income from all sources was £440,478, as compared with £397,205 for 1936-37. Working expenses, including a provisional sum for the purchase of electricity from the Board (which also covers interest and depreciation charges for local generation of electricity), totalled £276,646, as compared with £256,205 in the preceding year, leaving a gross profit of £163,832, as compared with £141,000. There was a refund in respect of income tax over the three previous years, of £7,084, and a net credit in respect of the Board's charges on the purchase of electricity during 1935, of £5,059.

After providing £69,679 for interest and redemption charges for distribution of electricity £106,296 is left. Of this sum, income tax absorbed £8,850, and special expenditure (largely of a capital nature) £50,294, leaving the above-mentioned net surplus of £47,152, as compared with £10,462 for the preceding year. A sum of £34,852 was placed to the credit of the appropriation account and reserve fund, which now has £168,007 to its credit.



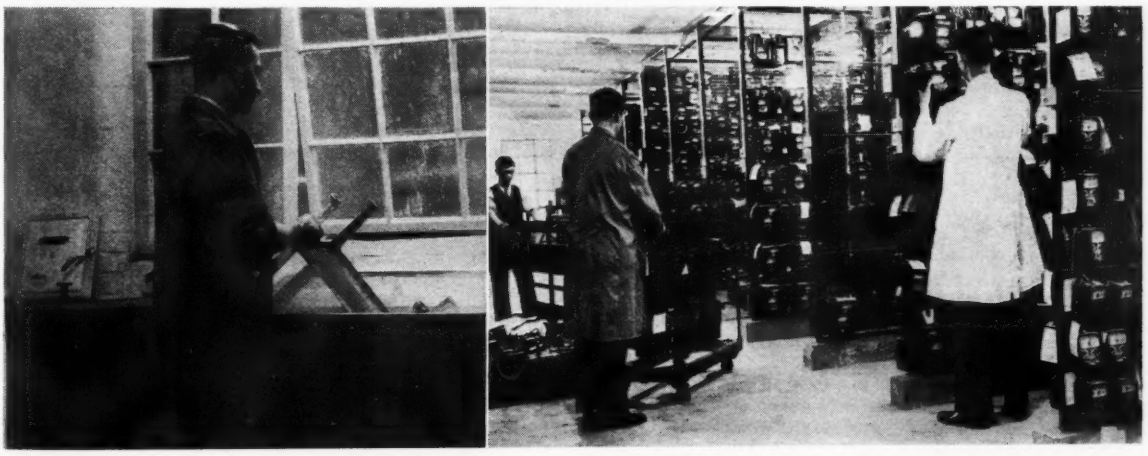


The King George V graving dock is the largest in the world. To pump out the water four pumps driven by 1,250-HP G.E.C. motors are used *[Elec. Rev. photos.*

The Department is just completing a 33-kV outer ring main. As a part of this ring main a section recently laid across the harbour was dredged and trenched 10 ft. below the mud. The undertaking now possesses 432 miles of underground and 46 miles of overhead lines.

The Southampton generating station is one of fourteen selected to supply the Central Electricity Board's South-West England and South Wales grid system area of approximately 17,100 sq. miles, with an estimated population of 6,306,500. The station has seven steam turbo-alternator sets and thirteen water-tube boilers aggregating 91,000 kW, and is the second largest in the area. The present output is about 287 million kWh per annum with a maximum demand of 75,900 kW and the coal consumption is about 160,000 tons per annum.

The system of supply is mostly 4-wire AC, and the remaining DC supply in the centre of the town is being rapidly changed over.



Left: Placing a cocker in an electrically heated cleaning vat at the Electricity Department's new domestic apparatus repair shop. Right: Storage racks at the new meter shop *[Elec. Rev. photos.*

Fire at Kingston Power Station

Widespread interruption of supply : Commissioners' inquiry

A NUMBER of Thames Valley districts were deprived of electricity for periods varying from 1¾ hours to two days as the result of a fire at the Kingston-upon-Thames Corporation's power station on December 14th. The roof of the station was burned out, the 11-kV and 3.3-kV switchboards were put completely out of action, and part of the generating plant (Brush-Ljungström) was badly damaged. The boiler house and a new uncompleted switch house remained unscathed. According to a statement by the borough electrical engineer, which is reproduced below, the trouble occurred in the vicinity of a Central Board circuit-breaker unit.

On Monday morning of this week, at the Guildhall, Kingston-on-Thames, a public inquiry was opened into the fire. Mr. Henry Nimmo, Chief Engineering Inspector to the Electricity Commissioners, conducted the proceedings. He pointed out that it was a public inquiry to investigate the cause of the mishap and the steps taken to restore the supply of electricity. He did not propose to enter into the question of how other electricity supply authorities affected exercised their discretion, or the manner in which supplies were restored to individual consumers.

After a number of legal representatives had announced their identities as representing interested bodies, including groups of industrial consumers, the Town Clerk of Kingston explained that restoration of the supply was notified locally on December 16th, coupled with a request to consumers to use as little energy as possible, and fires only when absolutely necessary. On December 17th, at 6 a.m., unrestricted supply was restored. The undertaking had never before suffered serious mishap.

There was no mystery about the present accident, and there was nothing to be concealed. The origin of the accident was "the earthing by a workman employed by the General Electric Co., Ltd., of a piece of live apparatus which set up an arc." That statement had been authorised by the G.E.C., but it was not proposed to call the man concerned to give evidence at that stage of the inquiry. The Town Clerk wished it to be understood clearly that no switch had "burst." There was no defect.

The Town Clerk next read several letters from consumers and others, including the local Chamber of Commerce, congratulating the Corporation on the manner in which supply had been restored. He publicly thanked the staff and workmen of the Corporation Electricity Department, the C.E.B., and the J.E.A. for their efforts to restore the supply.

Borough Electrical Engineer's Story

A statement prepared by Mr. E. J. Jarvis, borough electrical engineer, Kingston, was then read and corroborated. Statements prepared by the J.E.A. and the C.E.B. were also handed in, unread. The Town Clerk then proposed the adjournment of the inquiry, to which all parties represented agreed, on the ground that further time was needed to go more fully into the precise sequence of events. Mr. Nimmo accordingly adjourned the inquiry, stating that the date of resumption would be announced in due course.

In the course of his report put in at the inquiry Mr. E. J. Jarvis, borough electrical engineer of Kingston, said that the Kingston station is designated as a temporary selected station under the 1926 Act, and is operated in accordance with the requirements of the Joint Electricity Authority, in conjunction with the Central Electricity Board.

The generating plant consists of the following Brush-Ljungström turbine sets: Nos. 1 and 2, 1,250 kW each; No. 3, 2,000 kW; No. 4, 3,500 kW; No. 5, 3,750 kW. The boiler-house plant consists of one Stirling boiler (50,000 lb. per hour); one Vickers Spearing boiler (30,000 lb. per hour); and two Stirling boilers (21,000 lb. per hour each). Three 10-gallon "Foamite" fire foam generators were installed in the engine room, and twelve "Pyrene" extinguishers were distributed in various positions.

At 4 p.m. on December 14th turbines Nos. 1, 2, 3, and 5 were connected to the 3.3-kV bus-bars. Turbine No. 4 was being brought up to speed. All boilers were up to pressure and connected to the main steam range. The daily log sheets were destroyed, but it is estimated that the load on the station at 4 p.m. was as follows: Generating load at 3.3 kV, 6,000 kW, 1,000 kW of which was being exported to the 11-kV bus-bars. Import from Central Board to 11-kV bus-bars approximately 15,500 kW. The export from the 3.3-kV switchboard was therefore approximately 5,000 kW, and that from the 11-kV board approximately 16,500 kW.

At 4.17 p.m., in the vicinity of the Central Board oil circuit-breaker unit No. 2, there was a flash and a noise similar to that of an acetylene welder operating at this point, followed by dense smoke and flames from this position. At the same time all the incoming supply from the Central Board ceased. The heat being too intense for any approach to be made with the fire extinguishers, the fire brigade was called immediately. The switchboard attendant, who was in the recently constructed control room adjoining the engine room, on seeing the light flicker and hearing the noise, immediately returned to the switch gallery in the engine room and separated the 11-kV supply from the 3.3-kV supply by tripping the inter-bus transformer switch on the 3.3-kV switchboard, but he could not reach the 11-kV board owing to flames and smoke.

Subduing the flames at Kingston power station and (right) after the fire

The shift engineer took appropriate steps to shut off the supply of steam from the boiler house. The fire was soon under control, and a hasty inspection indicated that the damage to the 11-kV and 3.3-kV switchboards was such as to render them unfit for further use. Immediately consultations took place with representatives of the Central Board and the J.E.A., and it was decided to connect the 11-kV side of the Kingston transformer solid to the 11-kV side of the Central Board's 33/11-kV transformer, and in order to hasten the resumption of the supply Mr. Jarvis decided to connect the 3.3-kV side of the Kingston transformer to the new metal-clad switchboard which was in process of erection.

It was necessary to lay large lengths of cable and make numerous joints, and the supply was finally restored at 1.30 a.m. on Friday, December 16th, with the exception of one feeder, which it was not possible to interconnect with

(*Continued on page* 896.)

[Elec. Rev. photos.

Christmas Electrical Activities in London

1. Santa Claus arrives at Fulham. 2. Lighting fittings displayed by John Lewis, Ltd., Oxford Street. 3. The Fulham Christmas tree. 4. In Selfridge's electrical department. 5. "Snow White" at Camden Town (St. Pancras). 6. A window at Streatham (County of London Co.). 7. The Islington Council's Holloway showrooms

the town's network. Supply on this feeder was eventually restored by 6 a.m. on December 17th.

In spite of the severe fire, certain generating plant in the Kingston station has already been made available for operation in case of necessity. Mr. Jarvis concluded by expressing his thanks to all those who so kindly offered and willingly rendered assistance, and especially to the members of his staff and workmen.

Statement by the J.E.A.

Mr. F. W. Purse, on behalf of the Joint Electricity Authority, stated that at the time of the outbreak of the fire the Authority was taking the following supplies from the Board at Kingston: Twickenham and District (11,000 V), 5,800 kW; for Esher and Weybridge (11,000 V), 1,000 kW; for Surbiton (33,000 V), 2,800 kW; for bulk supply to Richmond (11,000 V), 2,200 kW; for bulk supply to Walton Council (11,000 V), 3,250 kW. The Authority was also generating 3,000 kW at its Twickenham station. The total load affected (apart from Kingston), therefore, was of the order of 18,050 kW. The number of consumers affected was 70,600, all of whom were without supply for the periods stated below: Surbiton, 1¾ hrs.; Twickenham (part), 1¾ hrs.; Esher and Ditton, 2¾ hrs.; Weston Green and Ember Court, 7¾ hrs.; Twickenham (remainder) and Richmond (total), 25¼ hrs.; Molesey: Walton and Weybridge, 49¼ hrs.

The following steps were taken to restore the supply: The Surbiton 33-kV supply being available from the new switchhouse, the mains were re-energised and supply fully restored to Surbiton at 6.0 p.m., December 14th. At 7.1 p.m. the Esher and Ditton area having been isolated, the existing link between Surbiton works and Ferry Road sub-station was brought into commission, and by means of this a supply was given to these districts. It was subsequently found possible to carry some additional load through this link and at Ferry Road sub-station the supply to Weston Green and Ember Court was restored.

To complete the supply on the Surrey side, it was necessary to excavate the ends of the Portsmouth Road feeders at the Kingston station so as to be able temporarily to connect up to the 11,000-V supply. The necessary work was completed at 5.0 p.m., December 15th, but, unfortunately, when switching in, one of the feeders was found to have been damaged, and this necessitated excavating another feeder for temporary connection. The work was completed and supply restored to Walton and Weybridge at 5.35 p.m., December 16th.

As the Twickenham generating plant was in commission, it was possible to utilise this for a section of the Twickenham area, and a load of about 3,500 kW was switched on at 6.0 p.m., December 14th.

The 33-V line was in existence and brought into use by means of temporary connections between the old and new 11-kV switchgear by cable borrowed from the C.E.B. The necessary work to bring this supply into commission was carried out, and the full supply to Twickenham (including Ham) as well as the bulk supply to Richmond was restored at 5.45 p.m., December 15th.

The Authority was able to bring into use its extensive organisation, and there was a total of 139 employés engaged on the various sections of the work. The work of travelling about the various parts of the area was severely hampered by heavy fog. Offers of assistance and supply of material were made from a large number of sources, and in particular the C.E.B. was very helpful in providing at a moment's notice some large cable for vital connections at Twickenham. Mr. Purse pays a tribute to the work of his staff.

The Central Board's Activities

The Central Electricity Board put in a statement in the form of a departmental letter to the manager of the South-East England District from the transmission engineer for the district (Mr. C. F. Bolton). This set out in detail the steps taken to restore the supply. On the evening of December 14th it was decided that the quickest way of restoring the supply was to cut the cable on the 11-kV side of a transformer (T.3) and jointing on to the Kingston 3,750-kVA, 11/3.3-kV transformer. A spare transformer was ordered to be sent from Northfleet to Kingston.

The Surbiton feeders were switched on from Wimbledon after T.3 33-kV oil circuit-breaker had been racked out by hand at 6.15 p.m. By 8 p.m. transformer No. 1 was made available to the J.E.A. for jointing the Walton feeders to the 11-kV terminals. The No. 2 transformer was dismantled and removed from its plinth to make room for the spare transformer, which was eventually placed in service early in the morning of December 17th.

In the meantime, on December 15th, a drum of 25-core cable from Wimbledon was run from transformer No. 3 for tap change, a temporary tap-change panel being installed in the control room. An auxiliary supply was then obtained from Wimbledon for operation of T.3 racking and for charging the battery. Transformer No. 1 was switched on from Wimbledon at 4.45 p.m., but tripped at once owing to a J.E.A. cable fault. At 11.40 p.m. the Kingston 3.3-kV system was made dead due to tap-change trouble in one of the transformers, but it was restored at 1.30 a.m. on December 16th.

Modern Street Lighting

A VISIT was recently paid by the Public Lighting Section of the Illuminating Engineering Society to Hackney and Hornsey to inspect the installations of the borough councils. The Hackney scheme, which resulted from a decision of the council to scrap entirely its old installation, will not be really complete with "Osira" mercury-vapour lamps throughout until the change-over from DC to AC in certain streets has been carried out. It involves the re-lighting of twenty-eight miles of main routes to class E standards and eighty-seven miles of side streets to class F and G standards at a cost of £84,000.

The tour included Kingsland Road and Northwold Road where 400-W lamps are housed in G.E.C. "Difractor" lanterns mounted at 25 ft. with a 4 ft. 6 in. overhang and 150 ft. spacing, and Rectory Road where 400-W luminescent lamps (said to be the first of their kind in the world to be put into commercial service) are mounted at 25 ft. with a 2 ft. overhang and 145 ft. spacing. Some 4,000 concrete poles are used. The scheme was carried out under the direction of the borough electrical engineer, Mr. E. A. Mills.

In Hornsey the installation, when complete, is to consist of "Philora" sodium lamps in eighteen miles of classified roads (12 miles of B.S.S. class D and 6 miles of class E), and of incandescent lighting in forty-eight miles of side streets (class G). The 697 sodium lamps (of which 430 are in use or erected) will consist of 405 of 150 W, 265 of 100 W and 27 of 65 W in "Golden Ray" lanterns by the Engineering and Lighting Equipment Co., Ltd., incorporating one-piece plate-glass reflectors developed in conjunction with Holophane, Ltd. The mounting height is 25 ft. with spacing between 110 and 132 ft. An unusual but effective arrangement was seen in Farrer Road (off Priory Road), where ten 65-W sodium lamps, mounted at 25 ft. and spaced approximately 110 ft. apart, illuminate an almost U-shaped 30 ft. street. At the B.S.S. test point, 0.15 ft. candles has been obtained which is well within class E. The estimated cost of the complete sodium scheme is £19,358, and the annual cost (excluding loan charges), £3,919.

Control is effected by means of the application of a DC bias to the network on the system of the Standard Telephone and Cables, Ltd., which operates polarised relays in the lamp columns; the bias is derived from a 6-V battery which, at the moment of switching on or off is connected between the star point of each sub-station transformer and the neutral conductor. The connection is established by contactors remotely operated from the generating station by push buttons.

The scheme (which included the change-over of sixty-one miles from gas to electricity) was prepared by the borough electrical engineer, Mr. F. C. Orchard, who was represented by Mr. A. Craven at the time of the visit.

Supply Interruptions

A BREAKDOWN at the Ferrybridge power station of the Yorkshire Electric Power Co. caused a short interruption —between five and ten minutes—in the supply to various parts of the county on Sunday night. According to the *Yorkshire Post*, there is believed to have been a short-circuit following a breakdown in the insulation of a large transformer. Fire broke out, but the works brigade quickly had this under control. Districts round Leeds and Bradford were affected.

An interruption lasting about a quarter of an hour in the supply at Beckenham (Kent) on Sunday is reported to have been caused by an overload, probably due to an unusually large number of people switching on electric fires and heaters on account of the cold weather. Similarly, there was a failure at Bedford, where there was only an intermittent supply for three and a half hours.

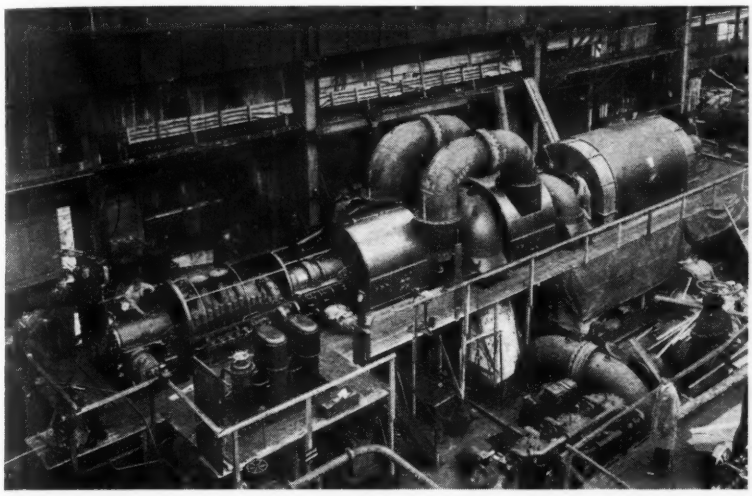
On Monday there were failures in North-West London, involving Cricklewood, Brondesbury and Edgware. The supply was restored in a quarter of an hour except at Edgware, where the failure lasted about an hour. There was also a breakdown at Ilford (Essex) which involved the large Clayhill housing estate.

Manufacturing Activities

Important contracts in hand

C. A. Parsons & Co., Ltd.

THERE seems little to complain of in the electrical industry to judge from the amount of work in hand in the shops of leading manufacturers. Much of it is of considerable technical interest as revealing trends in engineering. Thus C. A. Parsons & Co., Ltd., inform us that a feature of orders they are executing is the demand for 20-kV to 36-kV alternators with concentric windings. Included in these are two 50,000-kW turbo-alternators for Hams Hall station (Birmingham) and 30,000-kW sets for the Northampton Co., Derby Corporation and the Calcutta E.S. Corporation, Ltd. Two 50,000-kW three-cylinder tandem sets for the Bunnerong station at Sydney, N.S.W., mark an important advance in another direction. These are designed to run at 3,000 RPM; their capacity is the largest at that speed built in this country. Smaller turbo-alternators are under construction for the Dominions and South America.



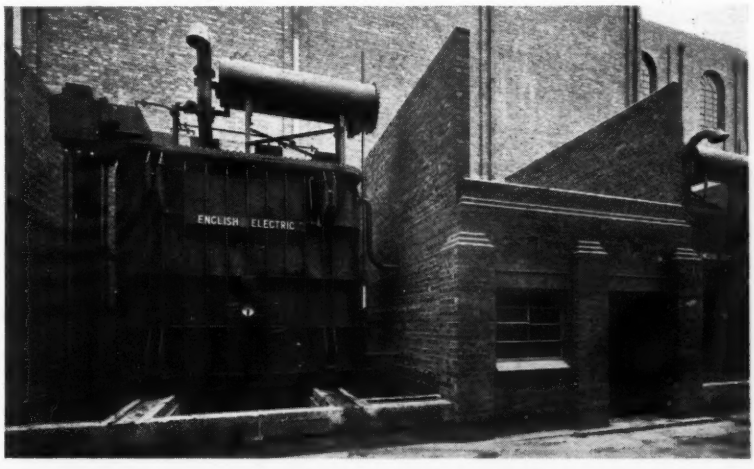
The first of two 50,000-kW, 3,000-RPM Parsons turbo-alternators for Bunnerong, Australia

Great activity is reported in the transformer department which is being extended again. The largest unit at present on the stocks is one rated at 36,500-kVA, 33/11-kV, for the Mersey Power Co. Another notable order is the 15,000-kVA 66/11-kV transformer with voltage regulating equipment for the Central Electricity Board. Methods of guarding against fire risks are illustrated by two 300-kVA air-cooled banks.

The mirror department is working to full capacity. Of more particularly electrical interest are the small reflectors for cinematographs, largely for export, and the trough-shaped parabolic reflectors for floodlighting aerodrome landing grounds.

English Electric Co., Ltd.

Sustained activity in both home and overseas markets is being experienced by the English Electric Co., Ltd., a notable feature of the company's output being the number of orders for Diesel engines from abroad. One of the most important of these was a repeat order for a 3,500-HP Fullagar engine generating set for Bermuda. Other contracts in hand range from 165-BHP four-stroke Diesels to 1,500-BHP two-stroke Fullagars with horizontally-opposed pistons. Following the setting to work of large hydro-electric plant at Lochaber and in India and South Africa, the company is engaged on the construction of two vertical-shaft 70-ft. head 125-RPM reaction water turbines for driving 16,666-kVA alternators for the Waitaki power station, N.Z., as well as smaller sets for New Zealand and Australia.



Two water-cooled 37,500-kVA, 11/66-kV English Electric transformers installed by the S.W. & S. Electric Power Co.

Steam turbines in course of manufacture include the 40,000-kW, 3,000-RPM sets for the Ferrybridge station (Yorkshire Electric Power Co.), a third 30,000-kW, 3,000-RPM two-cylinder impulse-reaction unit for Stourport (S. W. & S. Co.), designed for steam conditions of 625 lb. per sq. in. and 825 deg. F., and a 20,000-kW set for Huddersfield Corporation. In addition a large number of turbo-alternators from 800 kW upwards are being built for industrial plant and for abroad. An important recent technical development is the vortex type of blading for low pressures.

An interesting feature of the heavy industrial drives ordered is the large proportion requiring DC motors in view of the flexibility obtained with the Ward-Leonard system; an example of this is a hot-mill main drive which requires 10,000 kW of W.L. motor-generators. Nearing completion are reversing cold mills and skin pass mills for hot and non-ferrous work, embodying the maintenance of constant-tension on the strip, for Corby and for the British Aluminium Co. Winders under construction range in size from a 3,140 BHP Ward-Leonard equipment for the Rand Mines to some of 120 BHP for installation in China.

In the traction department, the ninety-nine Diesel rail cars for Buenos Aires are nearly completed, but contracts from the L. M. & S. Railway for twenty 350-BHP 0-6-0 Diesel-electric shunting locomotives, and for the re-equipping of the Liverpool-Southport electrified lines as well as sundry work for the Southern Railway and other orders are likely to keep this section busy for some time. Orders for trolley-buses continue to come in: for example, fifty-seven for Bradford with rheostatic braking on the series dynamic system; nine 70-seaters for Durban; and three for Alberta, Canada. Glasgow Corporation has also applied for twenty-five more all-welded underframes for its tramcars.

Fewer large transformers are in hand, but contracts have been received for two 20,000-kVA 132/33-kV units for the grid and a number of others from 20,000 kVA downwards, the majority with on-load tap-changing. On the other hand there is a more than compensating increase in the demand for capacities up to 500 kVA, some of which are for coupling to 33-kV lines direct without protection. Several large reactors are in course of construction, including a bank for the C.E.B. to give 10 per cent. reactance on 50,000 kVA at 132 kV. Flame-proof transformers carrying the Mines Department pentane certificate are in demand for 50-V lighting in oil refineries. Fire-proof air-cooled transformer and AC arc-welders up to 600 A are other interesting developments.

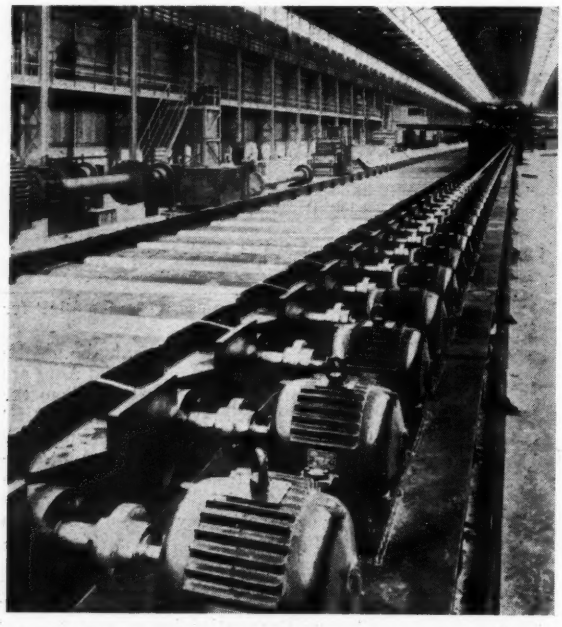
Notable among the high-voltage switchgear contracts are a 132-kV sub-station for the C.E.B., 66-kV equipments for extending the cellular switchgear at Stourport (S. W. & S. Co.) and 88- and 66-kV units for South Africa and India, while a new range of low-voltage switch fuses embodying high rupturing capacity cartridge fuses has been introduced by the company.

Mention should also be made of 21 steel-tank mercury-arc recti-

fiers for London Transport among others under construction. It is evident that the motor meter and domestic appliance departments are all doing their share to meet the demand for the company's many manufactures.

British Thomson-Houston Co., Ltd.

Out of the varied products of a concern like the British Thomson-Houston Co., Ltd., it is possible here to select only a few of the most notable as significant of the general trend of things. Starting from the generating end, there are the fourth 50,000-kW, 33-kV turbo-alternator for Ironbridge station (West Midlands J.E.A.), the 30,000-kW, 22-kV machine



Run-out table employing 241 B.T.H. motors in Richard Thomas & Co.'s new Ebbw Vale steelworks

for the Ayrshire Electricity Board, a 25,000-kW, 3,600-RPM double-extraction turbo-alternator (800 lb. per sq. in. and 800 deg. F.) for Ford's of Canada, and a superimposed unit taking steam at 800 lb. and 900 deg. F., exhausting at 400 lb. into a steam heater feeding in parallel with existing low-pressure boilers for the Delray power station of the Detroit Edison Co. At the other end of the long scale is a geared unit of 19 kW running at 10,000 to 15,000 RPM with surface condenser. An outstanding order received is for four 15,000 cu.-ft.-per-min. constant-pressure compressors delivering at 80 lb. per sq. in. and driven by 4,500-RPM mixed-pressure turbines.

One of the most important jobs in hand is the provision of 33-kV 1,500- and 1,000-MVA metal-clad single-break switchgear for the Bunnerong station at Sydney. Switchgear at the same voltage for rupturing capacities up to 1,500 MVA is also under construction for Dundee Corporation, the new Mulajore station of the Calcutta E.S. Corporation, Ltd., Spondon (Derby & Notts), Kearsley (Lancs E.P. Co.), and for the C.E.B. The first high-rupturing-capacity air-break switchgear in power station service is being provided for the new Littlebrook station (Kent Power Co.) in over 100 units. A further notable order covers a 425-V metal-clad vertical-plugging 19-panel switchboard rated at 32 MVA and embracing equipments up to 2,500-A capacity. Among the outdoor switchgear are three 1,500-MVA 132-kV units for the C.E.B. Mid-East England extension, and the equipment for six 33/11-kV sub-stations for the new Torquay rural scheme with connections with the 132-kV grid.

A new record in transformer output has been established recently, and units on order include 60,000-kVA for the West Midlands J.E.A., 30,000 and 15,000 for the C.E.B., from 15,000 kVA downwards for the Torquay rural scheme, and 13,333-kVA single-phase for Johannesburg Corporation, as well as a large number of distribution units. Progress is reported in the application of shields to high-voltage windings to improve impulse-stress distribution. Other transformers in production are for furnace work (up to 20,000 A secondary) and twelve-phase for rectifiers (including one of 5,000 A at 230 V with on-load tap charging for DC voltage regulation). The demand for arc-suppression coils and cast-in-concrete and oil-immersed reactors is growing.

The popularity of the trolley-bus is reflected in whole or part equipment for 354 vehicles for London, 60 for Capetown, and others for Wolverhampton and Durban. Activity in shipbuilding also is apparent in items of the large contracts for the *Queen Elizabeth* and the new *Mauretania* and several other British, Dominion and foreign lines, a good proportion being repeat orders.

A large number of rectifiers for unattended transport sub-stations are to be found in various stages of manufacture. One of these has a DC output of 4,350 A continuously and 8,700 A momentarily. On the industrial power side, one of the most interesting orders in hand is the electrical equipment of a hot aluminium breaking-down mill driven by a 1,350-HP 40-51-RPM DC reversing motor rated at 1,350 HP with a peak rating of 3,250 HP. This motor will be supplied from a motor generator with a flywheel having a stored energy of 50,000 HP/secs. DC motors up to 1,500 HP, motor generators up to 4,000 kW, and control gear are being built for other rolling mills in various parts of the world. DC motors up to nearly 3,000 HP, with Ward-Leonard sets, and AC motors up to about 1,400 HP, are also in hand for winders, largely for overseas markets.

In the lighting field the results of research are to be seen in the 40-W "Mercra" discharge lamp for use in connection with a pneumatic generator in coal mines and in the application of fluorescent powders to discharge lamps. Sound reproduction equipment represents another successful outcome of work in the company's laboratories.

Bruce Peebles & Co., Ltd.

Finishing off a year in which the output reached the highest point for many years, Bruce Peebles & Co., Ltd., have under construction motors of all sizes for almost every industrial purpose. Newcomers among these are totally enclosed fan-cooled and the mining-type flameproof AC machines. That there is still scope for DC is shown by the amount of converting plant going through the works, as exemplified by some 2,500-kW grid controlled rectifiers for the Southern Railway and an Indian order for a 2,500-kW and two 1,500-kW motor-convertors and a 300-kW rotary, but the preponderance of AC can be gauged from the capacity of transformers required for export as well as for the home market. Included in the latter are two of 30,000-kVA with on-load tap-changing gear for the 132-kV Scottish grid and two of 15,000-kVA and smaller units aggregating 20,500 kVA and 30,000 kVA for Scottish undertakings.

Western Electric Co., Ltd.

A fresh spate of orders towards the end of the year for "Mirrophonic" sound equipment (of the type to be installed on the *Queen Elizabeth* and the new *Mauretania*) is reported by the Western Electric Co., Ltd. Not only are new theatres being equipped in this way, but many existing installations are being converted. No revolutionary changes that would involve the scrapping of existing apparatus are anticipated, and any improvements will be engineered for adaptation to existing plants.

Several recent developments in the United States are under consideration for use in Great Britain; these include a miniature condenser microphone which is said to have achieved remarkable results in the laboratory.

Consulting Engineers

IN the absence of Sir Alexander Gibb owing to ill-health, the chair at the annual dinner of the Association of Consulting Engineers on December 16th was taken by Mr. H. P. Hill (past chairman, A.Cons.E.). The toast of "His Majesty's Ministers" was proposed by Mr. S. B. Donkin (past-president, Inst.C.E.), who mentioned the instant and unreserved offers of service made to the Government by consulting engineers together with their staffs at the outset of the recent national crisis.

Responding, the Minister of Transport (Dr. L. Burgin) compared the relative difficulties of those who worked with formulæ, constant and calculable, with those who had to deal with human beings. Sometimes he believed that inertia was the greatest force, but so long as constructive minds were available there was a future. Mr. G. M. C. Taylor proposed the health of "The Guests," on whose behalf Lord Sempill replied.

In giving the toast of "The Association of Consulting Engineers," Sir Cyril Hurcomb (chairman, Electricity Commission) said that consulting engineers provided an "intellectual grid" which should be made use of to speed up voltage standardisation (we refer to this in our leading columns) and the Association should be recommended to the Dominions and colonies as representing experienced engineers who had no axe to grind. He paid a tribute to the work of the late Sir John Snell, his predecessor, and also to that of Mr. J. M. Kennedy (vice-chairman, Electricity Commission), both of whom had been consulting engineers. Mr. H. P. Hill briefly responded on behalf of the Association.

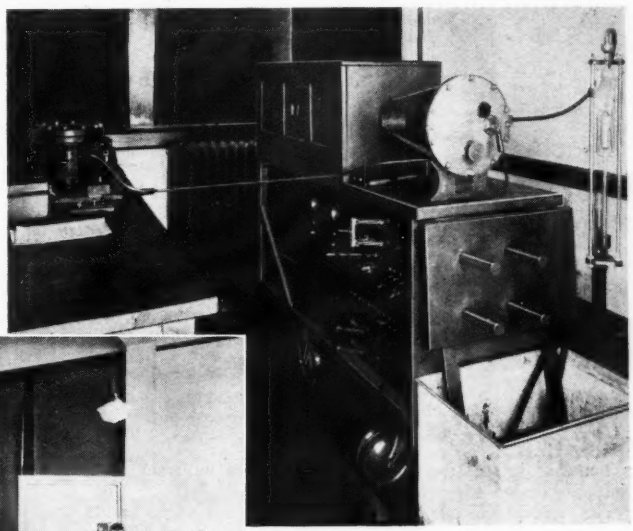
Training Students in Canada. By H. Vickers

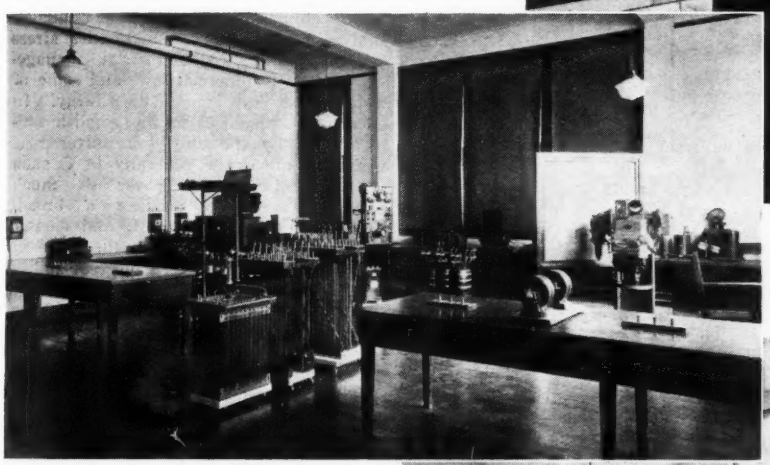
Besides reviewing Canadian practice Dr. Vickers expresses some interesting opinions concerning training arrangements in this country, to which he has recently returned after being for more than twelve years Professor and Head of the Department of Mechanical and Electrical Engineering at the University of British Columbia.

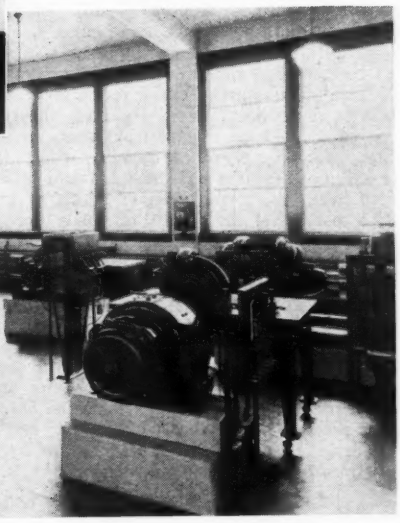
ACADEMIC training in electrical engineering is provided in the Dominion of Canada by the universities of McGill, Toronto, Queens, Alberta, Manitoba, Saskatchewan and British Columbia and by various technical colleges and schools. Four years' training is given in most of the universities, but in one, at least, *viz.*, British Columbia, five years are required for graduation.

The character of the training varies in some respects from that given in England, due principally to the requirements being different in the two countries. Many graduates find employment in hydro-electric engineering with its various ramifications. Large numbers are trained for the Bell Telephone Co., of Canada, for the General Electric Co., at Peterborough; for the Canadian Westinghouse Co., at Hamilton; for the Northern Electric Co., of Montreal, and for the large public utility companies of the Dominion.

Before dealing with points of difference in the training, I should like to remark on the great co-operation of the large companies mentioned and the universities. Every year the majority of these companies comb out the universities for their best men. The General Electric Co. of Canada sends each year its educational representative on a tour of the Dominion. He arrives with full cinematograph equipment, and shows two large films illustrating every department of the works at Peterborough and shows the work of each. Large generators, motors, transformers, switchgear, lamps, &c., are shown in course of construction, and the work of every department of the works and offices is carefully explained and particularly the training which graduates receive after entering the works, the rates of pay and social amenities. Stress is laid on opportunities for development with the company.







Above: Cathode-ray oscillograph room at the British Columbia University. Left: Junior laboratory. Below: Senior laboratory. These were all designed and equipped by the author

After the lecture, which is of one hour's duration, he obtains the views of the professor and head about his various students; and then, usually in the presence of the branch manager of the company, interviews each student and gets some idea of his personality. Strangely enough, his selections are often very different from the choice of the professor. Many times have I found brilliant young men passed over, presumably due to some defect in personality.

The other companies, *viz.*, the Bell Telephone Co. and the Canadian Westinghouse, rely almost entirely on the advice of the professor in their selection. Again, some of the best students are taken by the American Westinghouse Co., at Pittsburg and the General Electric Co. at Schenectady. These have excellent training schemes for graduates, and since the Canadian companies are really branches of the American companies, they are of interest.

Taking the Westinghouse Co. first, we find there are nineteen engineering departments, systematically arranged in three general groups on a basis of an occupational or functional classification. Graduates appear before the Educational Committee of the Engineering Department for a personal interview. Upon favourable consideration by the committee, students are asked to express their first, second and third preference for work by departments. Definite schedules are then laid out covering one year's period of training. The general features of this schedule are outlined below :—

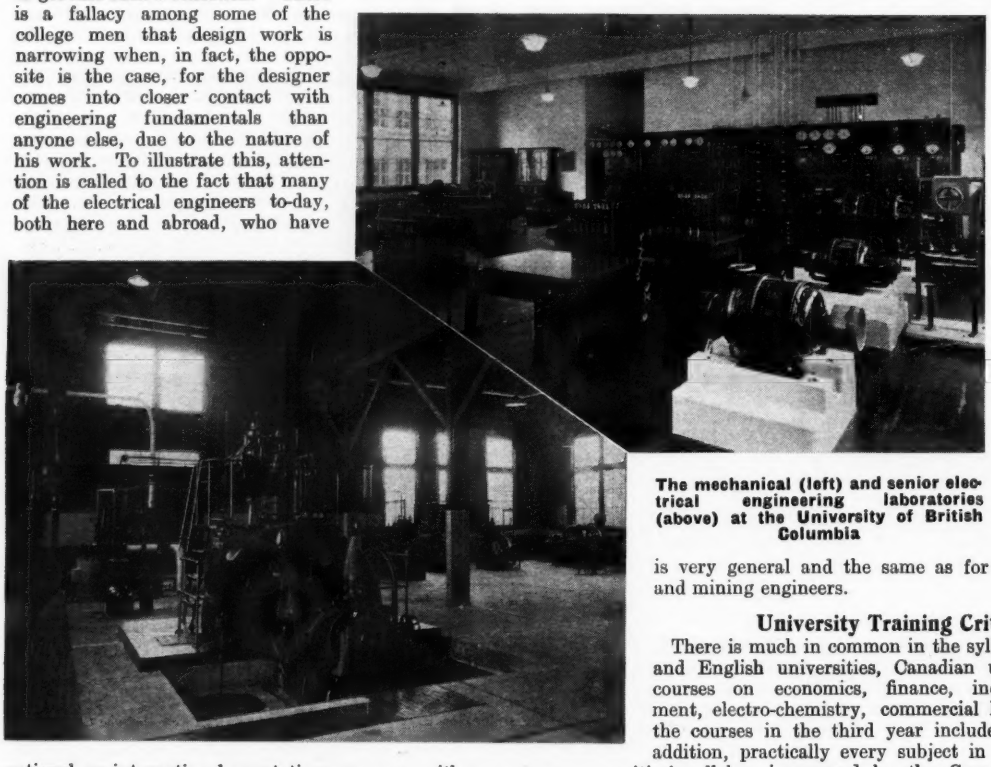
Group 1. (General Research.)—Research, Material and Process, Porcelain Insulator and Transmission Departments. Schedule: Manufacturing, three months; engineering laboratory, four months; engineering school, three months; and other assignments, two months.

Group II (Application and Equipment).—General, Railway Equipment and Switchboard Engineering Departments. Schedule: Manufacturing, three months; test, four months; engineering school, three months; and other assignments, two months.

Group III (Design). Machine, Transformer and Apparatus. Schedule: Manufacturing, three months; test, four months; engineering school, three months; and other assignments, two months.

The training these students get is excellent, and the engineering school is conducted by the most able of the technical staff of the company. It is interesting to quote the remarks

of the head of the Educational Department on design work, especially having regard to the views on this subject of various university people. "It is a common idea that our design work is more or less of a routine nature, and that in most cases the designer simply sits at a desk and works out the details of some part or piece which is assigned to him. The good designer does not work piecemeal, but when he is assigned to the duty of getting a certain result, he is expected to get it and is held responsible for getting such result. If he becomes a routine man it is because he has allowed himself to get into such a condition." There is a fallacy among some of the college men that design work is narrowing when, in fact, the opposite is the case, for the designer comes into closer contact with engineering fundamentals than anyone else, due to the nature of his work. To illustrate this, attention is called to the fact that many of the electrical engineers to-day, both here and abroad, who have national or international reputation, are men with very considerable design experience.



The mechanical (left) and senior electrical engineering laboratories (above) at the University of British Columbia

The General Electric Co. has also an excellent course for its graduates. It restricts the initial enrolment to about twenty-five men, who have successfully met the requirements; an entrance examination is given to test the student's knowledge of the laws of physics as applied to engineering, of mathematics and of essential definitions. The subjects covered during the first year are:—(A) Physics: Dynamics of solids, kinematics, thermodynamics, hydrodynamics, electrostatics, electromagnetism, magnetic circuits, electric circuits, electrical and mechanical analogies. (B) Mathematics: Algebra, determinants, ordinary differential equations, partial differential equations, Fourier series, Heaviside operational calculus, dimensional analysis, and theory of probability. Assigned problems require from twelve to eighteen hours of home work per week. A certain portion of the time of each meeting of the class is devoted to training in the expression of ideas, the oral presentation of which is under the guidance of a member of the faculty of Union College. The material for presentation is prepared by the students and includes both original papers and synopses of existing technical reports of the company. A course in economics is given, which deals with engineering aspects of the subject. Each Saturday morning 4½ hours are devoted to lectures and class work.

This is followed by two more years of work in courses similar to those of the Westinghouse Co. In the second year analyses of synchronous and induction machines and DC machines, transformers and heat flow are carried out, and in the third year problems in the theory of elasticity and its applications to the design of beams, shafts, bearings and frames and the study of stresses and vibrations in rotating wheels. The last part of the third year is devoted to the study of the flow of gases and liquids.

Similar training is available to few in England, and I feel certain that its importance has not received the recognition by English firms that it deserves. Thanks, however, to the organising genius of Dr. A. P. M. Fleming, the Metropolitan Vickers Co. is providing such training and such co-operation with the English universities. He, far more than any other man in England, seems to have appreciated the importance of post-graduate training and an orderly and systematic training of such students in engineering practice.

The practice followed in the training of college apprentices and also that of other apprentices at Trafford Park is similar to that of the Canadian and American companies. In Canada a very large large proportion, relatively, of the boys trained at the high schools go to the university, and most of them earn sufficient money during the summer months to pay their fees and maintain themselves. The university terms are arranged so that they can do this, *viz.*, from the end of September to the end of April. At the end of each session, these men, full of enthusiasm, go out and do all sorts of jobs: mining, power station work, smelting, and even labouring. They thus gain valuable experience in various phases of engineering work, and contrasting them with English students, I should say they are broader in experience and more adaptable. They enter the university with either junior or senior matriculation, and usually for the first two years their training is very general and the same as for civil, mechanical and mining engineers.

University Training Criticised

There is much in common in the syllabus of Canadian and English universities, Canadian universities stress courses on economics, finance, industrial management, electro-chemistry, commercial law, and some of the courses in the third year include metallurgy. In addition, practically every subject in the English universities' syllabus is covered by the Canadian universities. I should say that standards are lower generally in Canada than in England. The attempt to cover so much ground in their courses tends to produce a broad, rather than deep, knowledge of many things, and creates rather a superficial type of engineer, although there are in Canada to-day in the electrical profession men of great ability and distinction.

It always seems to me that a similar charge might be levelled against training in the English universities. The time spent in trying to teach specialist subjects, such as electrical design, electric traction, transmission and distribution of electrical energy, radio and other specialist subjects might well be spent in more fundamental work.

It is not that the subjects mentioned are not worth while, but usually they are taught by men who have no real experience in industry—by men who have lost the stimulus that contact with industry gives. How much do these young men get out of these courses? Not much of great value, I believe. Would it not be better, if the universities cannot provide the men with up-to-date knowledge of these subjects, to leave them alone and give the graduates a deep and thorough training in mathematics, pure and applied, and physics and foreign languages?

The syllabuses of all the universities, Canadian and English, seem to have the one idea of filling up the whole time with lectures and laboratory work. It is not education, in my judgment, but something which passes for education. The fact that it is necessary for firms like the Westinghouse, General Electric and Met.-Vick. companies, to provide post-graduate courses in mathematics and physics shows that university training is inadequate, that it has failed in its purpose. Why should the training in the basic subjects stop where it does, with an elementary training in calculus and differential equations, and the most elementary knowledge of heat, light and sound? Of course, it will be objected that post-graduate courses would be needed to meet the defects.

A glance at the subjects of the General Electric Co. rather shows the kind of training needed; for example, Heaviside calculus, Bessel functions, theory of functions of a complex variable, theory of probability, vector analysis, tensor analysis, theory of elasticity. How many electrical engineering students read Jeans' "Mathematical Theory of Electricity and

Magnetism," and how many *can* read it? How much contact does the average student get with the conduction of electricity in gases and so on?

The fact is that the universities seem to be doing work that technical colleges should do. In my opinion the curriculum for electrical engineers in Canada, England and America needs drastic change. The best results will never be achieved for the engineering profession until it is realised how necessary it is to give a thorough and deep training in the fundamental basic subjects of mathematics and physics.

In Canada much loss is experienced due to decentralisation of the educational system, and the same applies to Britain. Six universities exist where one or two might suffice. For example, it would be advantageous to have the electrical and mechanical engineering in one institution, rather than in three scattered institutions. British Columbia, Alberta and Manitoba could combine their facilities to advantage.

Empire University Proposed

In England would it not be better to have an Empire university and technical college, equipped for the training, both technical and practical, of its students, with modern equipment and the best brains selected for instruction, than the scattered facilities available now? Such an institution, under Government control, could provide in a better way the engineering training required for all branches of industry; and being closely linked up with industry and having its hands on the pulse of industry and knowing the requirements of both industry and the individual, could provide personnel properly trained for the country's service in both peace and war.

I believe the cost of such an institution would be far less than the cost of the many institutions carrying on engineering education to-day. It would probably be very large and yet not unwieldy, but at least it would ensure the proper education and training of engineers. It would also enable the best brains of the country, scientists, engineers, mathematicians and experts in industry to get together and receive inspiration from each other. In it the problems of research and development might be carried on for industry. To be effective it should be linked up with industry as closely as possible, and it should draw many of its teachers, especially for specialist subjects, from the best firms. Thus might be remedied the serious defect of engineering education to-day, *viz.*, the lack of close contact with industry.

In passing, it may be mentioned that excellent laboratory facilities exist at McGill, Toronto, and in most of the other universities. High-voltage laboratories exist at McGill, where for many years high-voltage engineering has been carried on, and the same is true of Toronto.

In all the Canadian universities students can pass from one year to the next in their courses with failures in three or four subjects in the first three years, but, of course, they must pass in these subjects and remove the defects in their standing in that year in addition to carrying the work of the new year. Seldom, however, is a student allowed to enter the final year with failure in any subject.

Research Work

Fees in Canadian institutions vary from $150 to $200 (roughly £30 to £40) a year. Cost of living is roughly £2 a week for board and lodging. Research work done in the Electrical Engineering Department of the University of British Columbia, over which I presided for 12½ years, included:—Elimination of Magneto Noises from Aircraft Receiving Sets, published in the journal of the National Research Council of Canada; Torque in a Bepolan Induction Type Instrument, by H. Morton, presented before the National Convention of the American Institute and published in the journal of the A.I.E.E.; Analysis of Unbalanced Conditions in Induction Motors, by Edward Lunn, delivered before the National Convention of the American Institute and awarded a prize by the Institute; A New Piezo-Electric Indicator, by R. W. Klinch and W. Lind; Influence of Asymmetry of Air-gap Circulating Current and Commutation in DC machines, by D. Smith; Rectification at Dry Contacts; Static Balancers, delivered before the Convention of the American I.E.E.; Economics of Public Utility Systems.

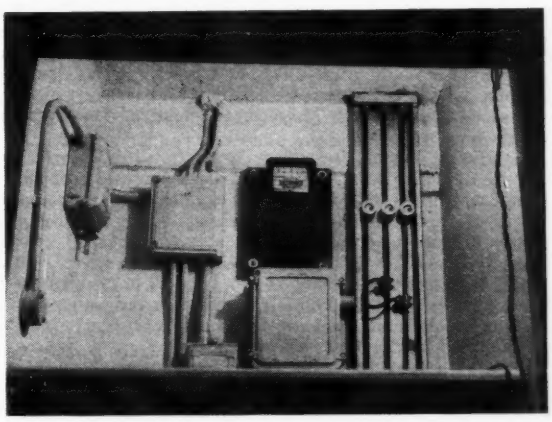
These and many other researches were carried out in the laboratories, which I had the privilege of designing. Many of the graduates of the university are occupying important positions on the technical staffs of the large companies in Canada and America. In one year alone, three of my students secured the three Fellowships at the California Institute of Technology, and the Institution ranked as one of the best with the American Westinghouse Co. I think it will be agreed that the Dominion of Canada possesses in its engineering schools much of the vitality and initiative and progress shared by those of its great neighbour.

Here and There

By Nomad

THE urgent need for greater wiring facilities for normal dwelling houses has been brought to light lately, and in the leading article in the ELECTRICAL REVIEW of November 18th the suggestion was made that some sort of a bus-bar system around the room might solve the problem. My first reaction to this suggestion is that such a system would prove too costly, if only because of the special housing necessary. Mr. Duckworth, consumers' engineer at Croydon, however, considers that the scheme might not necessarily be unduly expensive if it was regarded from the viewpoint of future load development. Most engineers with whom I have discussed the proposal have attacked it on the score of inadequate safety, but if cost were not a consideration such a system could be made to comply even with the present Regulations.

As one who has abounding faith that eventually the electrical industry will properly explore the tremendous space-heating field and capture the load that is waiting therein, I



Rising main and service for one flat at Silchester Court, Thornton Heath

should be sorry to see the general adoption of any costly scheme for installation sub-distribution until the industry has made up its mind what form or forms of space heating, which may need special circuits, must be adopted to win the load.

* * *

Another scheme was suggested by Mr. T. C. Gilbert in the ELECTRICAL REVIEW of December 9th, namely, a ring main round the house incorporating looped sockets. He suggested 7/.036 cable and a 30-A switch-fuse feeding both ways for a dozen plugs. This scheme has also been attacked on the score of inadequate safety and Mr. Hainsworth (Croydon) thinks that with only fused plugs for the protection of appliances there would not be adequate protection for the sockets, and that the 30-A switch-fuse would have a comparatively large short-circuit value at any one point. Mr. Owen, accessories manager of the Sun Electrical Co., Ltd., is doubtful about the saving suggested over the orthodox tree system. Against the suggested 7/.036 cable for the ring main he would use only 7/.029 for the tree branches, and the cost of the fuse-board would not seriously affect the problem.

I believe there is a tendency to treat the ring-main idea too lightly, and that there are distorted views of its use on underground and overhead supply distribution systems. The main principle of such systems is supply continuity and the additional cost of isolating equipment often rules out any question of saving in material costs. Indeed, there are very many supply tree systems which would certainly be ring mains but for the necessity to economise.

* * *

I have been very sorry to see the inadequate attention given by our load builders to the call made by the Electrical Association for Women for the provision of more "outlets" when buildings are erected. Why not rising mains for ordinary houses with tree wiring on each floor, embodying separate branches for heating circuits and a c.t.s. cable round each room as a definite *architectural feature* for, say, six or eight "light-current" points?

Having inspected recently the rising mains system at Silchester Court, Thornton Heath, I see no reason why the advantages of the system cannot be extended to ordinary dwellings. The ⅜-in. copper-rod risers serve five floors and there is a self-contained service from each riser on each floor for one flat of three or four rooms.

Meetings and Discussions

Surveying the development of electrical propulsion of ships at the North-east Coast Institution of Engineers and Shipbuilders last week, Mr. L. R. Horne commented on the fact that there were only forty-one large vessels propelled by steam turbo-alternators. Owners, he said, seemed to prefer the type of machinery that their staffs understood best. An interesting part of the I.E.E. meeting in London last week was the exchanging of greetings with remote parts of the Empire, special equipment having been set up to demonstrate Mr. K. L. Wood's paper on Empire telegraph communications.

Electrical Propulsion of Ships

HOW electrical propulsion of ships has developed during the last hundred years is told in a paper by Mr. L. R. Horne (Lloyd's Register of Shipping) which was read at the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle on December 16th.

A Russian first used a battery-driven motor to propel a boat in 1839. In 1882 an iron boat was electrically propelled on the River Thames. Submarines were built at Tilbury in 1886, in France in 1888 and in the U.S.A. in 1901. Diesel-dynamo machinery built in Sweden was put into use in Russia in 1903 and in 1908 the German Navy commissioned a turbo-dynamo vessel.

In 1910 Mr. Henry Mavor first demonstrated AC propulsion and in 1913 the U.S. Navy completed a large experimental collier, which was soon followed by large battleships equipped with steam turbo-alternators, three-phase, driving high-voltage motors of differing designs with various methods of control made by the G.E.C. (of America) and Westinghouse concerns. American aircraft-carriers of 40,000 tons have steamed over 34 knots, developing 210,000 SHP, having four turbo-alternators of 40,000 kVA and two similar, but independent, 5,000-V motors of 22,500 SHP on each of four shafts.

In 1914 the twin-parallel alternator system driven by Ljungström turbines was introduced with mechanical, in addition to electrical, gearing coupling the induction motors. The synchronous motor drive was developed in the U.S.A. about 1919 and when the B.T.H. system was applied in 1921 no enthusiasm for electrical propulsion in any of its possible forms could be discerned in England. Since then several passenger ships have been built in England (B.T.H. and G.E.C. equipments) and America, which the author describes as excellent examples of turbo-electric synchronous drives for limited draught with high manœuvring capabilities.

The "Normandie"

The climax of development was reached in 1935 with the commissioning of the French (Als-Thom) *Normandie* of 83,423 tons, whose designed 160,000 SHP has been much exceeded in steaming at over 31 knots, each of the four screws being driven by a 40,000 SHP synchronous motor. The three-phase, 5,000-V alternators cannot be run in parallel and though steam is used at 400 lb. and 680 deg. F. the consumption is as low as 0.65 lb. per SHP per hour, including engine room and deck auxiliaries. The owners have stated that electrical transmission is in no way inferior to mechanical gearing and, as regards manœuvring, conditions are enormously in its favour, while reliability has been remarkable.

Two synchronously driven ships have been built in Germany. One has two motors of 13,250 SHP at 3,100 V and the other 13,000 SHP motors at 6,000 V. The fuel consumption is about 0.66 lb. of oil per SHP-hour. In one case the length of the machinery space is three-quarters of that in a duplicate geared turbine vessel. An emergency reversal from 82 RPM ahead stopped the propellers in 20 seconds and the ship appears to have come to rest in 90 seconds in rough weather.

Of the many advantages generally proved for the Diesel-electric form of propulsion, according to the author, the greatest is flexibility in design and operation. There has not been any spectacular advance in the use of DC; its most impressive feature is rather the way in which it has successfully solved a multitude of propulsion problems. When economy at full speed is the principal criterion DC drive cannot compare in the author's opinion with directly coupled or geared Diesel engines. But when other factors are of greater importance it has won very wide acceptance, the factors most in its favour being capability of satisfying large demands for power for non-propulsive purposes, as in tankers, Great Lakes vessels, dredgers, ice-breakers, fire-floats and yachts; ease and reliability in manœuvring; towing when a strong stationary pull is needed and for ferry services. The author mentions equipment of the G.E.C., American G.E.C., Westinghouse, B.T.H., Brown-Boveri, English Electric, Harland & Wolff, Société Als-Thom and Siemens-Schuckert designs with particular reference to differing methods of control and performance.

Auxiliary electric drives, turbine and Diesel, have been fitted in a number of merchant ships and a few naval vessels, while quite recently several vessels equipped with Diesel-electric AC drives (Brown-Boveri) have been commissioned in Germany.

General Conclusions

The author's conclusions are that for high-powered installations electrical propulsion by steam turbo-alternators has proved itself adequate for the highest powers. It claims advantage when manœuvring is of the greatest importance and in the latest installations the margin between the full speed efficiencies and first costs of turbo-electric and mechanically geared turbines is very small. The heavy, if robust, induction motor has given way to the lighter synchronous type, which has proved itself thoroughly reliable and easy to overhaul. Oil-immersed switches and liquid rheostats have been displaced by contactor gear, the amount of maintenance needed being small. Nevertheless, there are only 41 electric vessels of 486,583 tons. Owners seem to prefer the type of machinery which their engineering staffs understand best.

In the case of small and moderate sized vessels the rivalry is more intense and progress more definite. A large proportion of Diesel-electric vessels are used on inland waters, or are of less than 100 tons gross, or for some other reasons are not included in classification returns. The latest returns of 69 vessels of 176,407 tons are therefore numerically far short of the total in use.

Probably there are about 250 Diesel-electric vessels of 250,000 tons, 42 per cent. under 500 HP, 37 per cent. between 500 and 1,000 HP and 21 per cent. over 1,000 HP. The advent of the Diesel-electric AC drive seems likely to increase the proportion of the third category.

Empire Telegraph System

A LARGE number of visitors attended the December 15th meeting in London of the INSTITUTION OF ELECTRICAL ENGINEERS at which Mr. K. L. Wood read his paper (to which reference was made last week) on the engineering aspects of cable and wireless telegraphy within the Empire.

For purposes of demonstration the author had set up in the lecture theatre modern automatic senders and receivers, certain component parts of which had never before been publicly exhibited. The apparatus was connected to the Moorgate headquarters of Cable & Wireless, Ltd., so enabling the I.E.E. president (Dr. A. P. M. Fleming) to exchange greetings by radiogram, at the rate of 150 words per minute over the wireless beam circuit to South Africa, with Mr. G. H. Swingler, city electrical engineer at Cape Town, who is also local hon. secretary of the I.E.E. for the Cape, Natal and Rhodesia.

Greetings were similarly exchanged between the president and the company's staffs at Singapore, Penang, Colombo, Seychelle Isles, Aden, Port Sudan, Suez, Alexandria, Malta and Gibraltar, *via* Porthcurno (Cornwall) and London, the submarine cable circuit utilised in this case being 21,170 nautical miles in length and including 23 intermediate stations. The remarkably short time in which a signal travelled out to Singapore and back to the I.E.E. was audibly demonstrated, after which all intermediate stations in the cable chain were deliberately desynchronised in order to demonstrate how they were all automatically brought back into phase in about one minute without manual adjustment.

Sir George Lee's Views

Sir George Lee opened the discussion by commenting on the clever design of submarine cable telegraph apparatus and the high degree of precision with which it functioned. Since the cable and radio services had become complementary to each other it was now possible for message routing and traffic sharing to be arranged in the most economical manner. The degree of constancy of a crystal oscillator was remarkable and he would prefer to use this device for synchronising purposes. Sir George mentioned that the P.O. had developed a trailing fault locator which reacted to high frequency AC fed into the cable, for finding cables on the sandy bed of the North Sea.

The author's use of the term "baud" to represent a time interval instead of speed caused Sir George to plead for conformity with international nomenclature. The state of a

60-year-old cable recovered from the Irish Sea indicated that some forms of cable-sheath corrosion were probably bacterial in nature, but there was no definite proof. They did not really know where or how fast wireless waves travelled. Their speed was said to be equal to that of light, but there was evidence to the contrary and there was also evidence that radio waves deviated. Little benefit would therefore result from making beams too precise or narrow. An angle of 12 to 15 degrees above the ground seemed to give the best result. Sir George could not agree with the author that 1937 might be the peak year of the present cycle of solar activity, for 1938 disturbances had been greater than last year's.

Mr. A. Davidson suggested the use of concentric cables for shore ends in preference to three-core. He recalled the "pushing" of messages through a long chain of relays by brute force, on one occasion 220 V positive and negative having been applied. The western portions seemed to be more liable to earth currents, probably because they were nearer the magnetic pole. "Drift" due to earth currents had been reduced by increasing cable voltage from 60 to 100 and had been found worth while.

Mr. F. W. Phillips said that even a layman must marvel at the progress which had been made and the technical staffs responsible had the satisfaction of knowing that their work benefited mankind. One section of opinion in America was that television would eventually supersede all forms of telegraphy and telephony and that view was strongly held in some quarters. He was impressed by the scope and variety of service conducted by the author's organisation, and there was great satisfaction at the recent reduction of rates which had been made possible by technical advances, and it was to be hoped that such reductions would lead to increased traffic.

Mr. T. E. Herbert suggested that the "Telex" service might be more suitable than the telephone for the collection and delivery of telegrams. The author had somewhat overstressed his reference to the three-element code as against the 5-unit code. Some forms of synthetic insulation promised to be superior to other known forms, if their mechanical characteristics could be improved. Much of the remarkable development referred to in the paper had resulted directly from the work of the author and his colleagues, although they worked so quietly that many people imagined nothing was being done. The Navy was known as the "silent service," but Cables and Wireless, Ltd., appeared to be 70 db below the threshold of audibility. The extraordinary flexibility of traffic diversion in cases of emergency and the beautiful mechanical design of the apparatus employed, for which the author was personally largely responsible, were most impressive features.

Ploughing Cables

Mr. H. Kingsbury said that the proof of the pudding was not only in its eating but in its digestion. It would be some years before the process now going on could be pronounced a success. He did not doubt that eventually two cables could be ploughed simultaneously into the sea bed at different depths. There was no difficulty in ploughing a light type of cable, the heavier type having been tried first merely for convenience. Adjustment of tension was the most troublesome part of the process.

Mr. H. H. Harrison used the blackboard to illustrate his suggestion that a perforator was not necessarily indispensable and that an undulator recorder might be used to provide specially grouped signals which would enable distortions to be clearly seen.

Mr. W. F. Bevis said it was ten years since he had had anything to do with telegraphy, but he was surprised that moving-coil devices were still in use at the cable head. He would have imagined that such devices would have been displaced by a transformer-valve-amplifier combination working on an impulsive system so as to enable earth currents to be minimised, and also to reduce maintenance.

Mr. J. F. Brock mentioned that valve amplifiers in place of moving coil recorders had been used for transatlantic traffic and had similar characteristics to those of the ordinary magnifier. He also suggested that the five-unit code had several advantages from the point of view of channelling.

The author, in reply, said that he had not used the trailing electrode method of locating cables because that device was intended for shallow water, but he hoped something further would be done in future. The reason why such modern methods as crystal frequency control and valve amplifiers were not used was that the existing equipment was so very reliable and trouble-free that there was no urge to replace it. Neither would the more modern methods produce greater speeds of signalling.

Electrical Measurement Progress

IN an address to the ROYAL SCOTTISH SOCIETY OF ARTS at Edinburgh on December 13th, Mr. A. Morris, of Edinburgh Corporation Electricity Department, dealt with "Progress in the Art of Measuring Electrical Energy." The speaker traced the evolution of the art from the electrolytic meter of Edison, the clock meter of Kelvin, and the mercury meter of Ferranti to the products of the present day. Progress in this field had received considerable impetus from the more stringent requirements of the Central Electricity Board. How well British manufacturers had met this demand was indicated in the address, which was illustrated with lantern slides.

The Eye and Subjective Brightness

THE response of the human eye to light in relation to the measurement of subjective brightness and contrast is discussed in a paper by Dr. W. D. Wright that was read before the ILLUMINATION ENGINEERING SOCIETY in London on December 13th.

The first section of the paper is a condensed summary of information available about the reactive response of the eye when stimulated by light. It includes data derived directly from physiological experiments and by inference from sensory observations. Two processes, an electrical and a chemical effect, are referred to in detail in so far as they control the sensitivity of the eye and govern the magnitude of the visual response. The second section of the paper outlines the conditions necessary to reproduce a standard scale of subjective brightnesses, and then considers methods, by memory or by binocular matching, by which an unknown brightness may be compared to the standard. In the third section the subdivision of the standard brightness scale into a series of contrast steps is discussed, and the means by which an unknown contrast may be referred to the standard scale are considered.

The author's survey is an attempt to visualise the problems likely to be encountered in any attempt to measure the subjective effects of light. The first reaction may be that the difficulties are so numerous as to make the task almost hopeless. Nothing would be gained by shirking these difficulties; it is much better to examine them critically and estimate their magnitude as the author has tried to do. It is not uncommon, after a subject has been examined as a complex academic problem, for engineers to overcome the objections and provide an entirely satisfactory answer in some simple way, which is what the author hopes will happen in this case.

The Batti-Wallahs

THERE was a large attendance at the monthly luncheon of the Batti-Wallahs' Society which took place, as usual, at the Hotel Victoria on December 14th, with Mr. R. H. Gummer (president) in the chair. The principal guest was Mr. H. J. Wellingham (personal assistant to the general manager of Cable & Wireless, Ltd.) who, in the course of an address, recalled that it was just 101 years since the first land line telegraph cable came into operation, between Euston and Birmingham, for the use of a railway company. With the aid of maps Mr. Wellingham outlined the "via Imperial" submarine cable and wireless telegraph routes to all parts of the world; and then described the make-up of a submarine cable, pointing out that that industry and the capital invested in it was entirely British. A large number of lantern slides were used to contrast early Marconi radio-telegraph apparatus with modern transmitting and receiving equipment, the lecturer mentioning incidentally that a modern transmitting valve cost from £60 to £120.

He proceeded to describe the wireless photo-telegraphy services, followed by an outline of the sequence of processes through which a cablegram passed from the time it was handed in to its delivery. Finally, the lecturer detailed, step by step, the recovery of a submarine cable for repair from both shallow and deep water, mentioning that a cable had been picked-up from a depth of 4.5 miles and that the actual repair could be completed in 80 minutes.

A vote of thanks was proposed by Sir Geoffrey R. Clarke, who stated that about 95 per cent. of the world's submarine cables had been made and laid by the company with which he was connected. The first underwater telegraph cable was made in India in 1883 and successfully laid across the Hooghly River in Bengal. Sir Geoffrey expressed the opinion that the combination of the cable and wireless interests had enabled both to advance.

The guests included Sir W. Womersley, Deputy Postmaster-General, Prof. J. C. van Staveren, director of the K.E.M.A. and of the Union of Governors of Electricity Undertakings in Holland, Mr. A. Davidson, European Communications representative of the International Telephone and Telegraph Corporation, Mr. L. J. Ranson and Mr. B. H. Musgrave.

At the next monthly luncheon, on January 11th, the principal guest will be Mr. S. F. Rous, secretary of the Football Association, who will talk on "Sport and National Fitness." The annual dinner and dance of the Society will take place on March 17th, 1939.

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electricity in Coal Mines

I AM surprised to read in the current issue of your valued periodical what appears to be a contribution by me to the discussion on Mr. R. Nelson's paper "Electricity in Coal Mines" at the Institution of Electrical Engineers, on December 1st, and I am of the opinion that a mistake has occurred in the initials, if not in the name.

I should also like to take this opportunity of dissociating myself from a statement attributed to me, on page 23, lines 4, 5 and 6 of the Mines Department's Report on the Explosion at Markham No. 1 Colliery (Cmd. 5849), wherein it states, "and so when the tub smash occurred and the dust cloud was formed the fire ignited this and brought about the explosion."

This is entirely contrary to my conception of the sequence of events which occurred and led to the development of the explosion. I was informed that I was to give only evidence of fact at that stage of the inquiry and was not asked for my opinion as to how the coal dust explosion may have developed, but I did state that a localised cable-fault was found in a piece of old type jute insulated, paper-filled, vulcanised bitumen sheathed, double wire armoured cable, a type of cable which did not comply with any of the B.S.I. specifications. On dissecting the cable at the fault it was found that whilst the jute insulation and paper-fillings had been incinerated for a length of six feet and the galvanising on the inner armour wires was burnt for a length of two feet, the galvanising on the outer armour wires was unburnt. (A somewhat similar type of fault to that reported in H.M. Electrical Inspector of Mines' Report for 1936, page 34, No. 2.)

I trust you may be able to afford me a small portion of your space to assist in correcting the wrong impression which appears to have arisen from the mis-statements referred to above.

A. R. CHAYTOR.

Chesterfield, *December 13th.*

[We regret the error in our report of the I.E.E. discussion. The speaker was Capt. J. C. Chaytor.—EDS., ELEC. REV.]

Electricity on the Farm

As an electrical engineer who happens to have been in close touch with agricultural oil tractors, and had many opportunities of watching their performance during the past five years, I would suggest that the development of the electric farm tractor can only be hindered if its friends fail to realise that it has to compete against a really efficient machine.

What Mr. McDowall conveys in his letter in your issue of December 9th was, no doubt, true of most oil tractors some twenty years ago when a number of firms who knew little or nothing about the business began making tractors mainly with the object of getting rid of material left on their hands after the war. It is long, however, since the industry recovered from the setback caused by the flooding of the market with these machines, and there are plenty of ten-year-old tractors now at work on which an average of no more than £5 a year has been spent in repairs.

With the large number of different makes and models, suitable for all kinds of work to choose from, a farmer has only himself to blame if his tractor is ready for the scrap heap at the end of two years; or if he pays £500 to £600 for an outfit when one costing £200 to £300 will do his work. There is a good choice of two- and three-furrow wheel tractors capable of continuous heavy work within that price range.

Full information concerning the performance of oil tractors, both wheel and track machines, can be got from the Nebraska State tests and the tests carried out periodically, under the Royal Agricultural Society's tractor testing scheme, by the Oxford University Institute for Research in Agricultural Engineering.

Cambridge, *December 14th.* J. F. LAMB.

In his article in your issue of December 9th Mr. W. Fletcher Cooper mentions the case where a farmer was unable to obtain particulars of electric sterilising equipment from a large retailer in a county town and suggests that the electrical industry is to blame. I would have thought that every progressive agricultural machinery dealer would have been aware of a source of supply for electric sterilising equipment, because it has been extensively advertised and described, not only in the farming press but also in the dealers' trade paper, and has been exhibited at practically every important agricultural show during recent years. If Mr. Cooper will let me have the name and address of the dealer in question I can assure him that immediate steps will be taken to enable the dealer to handle inquiries in the future.

Mr. Cooper also mentions the case of a farmer who had to overcome considerable opposition when wishing to purchase a 10-HP electric motor, the dealer wishing to sell him a Diesel engine. Surely this was due to the dealer being an agent for Diesel engines and having little interest in selling electric motors. The farmer would have found a very different state of affairs if he had gone to an electrical retailer.

A lot is being done and much money is being spent to educate farmers and agricultural machinery dealers in matters electrical and in many districts energetic selling methods are adopted by supply authorities and others. Mr. Cooper might be doing the industry a service if he were to write a report on some of these activities, which might serve as a stimulus in less enterprising localities.

F. E. ROWLAND,
Agricultural Dept.
GENERAL ELECTRIC CO., LTD.,

London, W.C.2, *December 14th.*

Hull and the I.M.E.A.

The impasse which has arisen between Hull Corporation and the Incorporated Municipal Electrical Association is simply a pointer to the need for alignment with constantly changing conditions. Were the activities of the I.M.E.A. confined to technical engineering matters there would be no impasse, or for that matter, little need for non-technical Council representation. As matters stand there is a useful and extensive field for Council representation because of the inclusion of engineering economics in the Association's annual programme.

It is difficult to successfully dispute the right of a democratic administrative assembly such as Hull Corporation to choose its representative for municipal affairs where there is an obvious field for such representation. There is no doubt that pressure of changing conditions will tend to divide responsibilities and that the I.M.E.A. will make the necessary adjustments in view of the undoubted demand for members thoroughly equipped in the field of municipal economics.

December 16th. DEMOCRAT.

Duplicated Supply Points

The average engineer in this country has had relatively few years of experience of very high-voltage operation and its attendant phenomena and so must learn all that engineers in the United States and other countries more advanced than our own have learnt by experience and research. In the States, the first 110-kV line was put in service thirty years ago, whilst only fourteen years ago I was engaged on development tests of, I believe, almost the first 110-kV switches to be manufactured in this country.

It would appear from the large areas affected by breakdowns in Great Britain that distribution is fed from one central point instead of two or more, as is the practice in other countries. True, the latter method involves more capital expenditure, but, surely, provision for all stations to be fed from more than one point and all cables to be fed from both ends (thus eliminating more than temporary shut-downs) would be more than justified if it prevented serious losses like those involved by the failures which occurred recently at Birmingham and Kingston.

It would also appear that the protective system leaves much to be desired. I have noted that line faults, during storms, are not confined to the one line only, but invariably cause other lines to trip, thus aggravating the shut-down.

London, W.1, *December 19th.* P. A. TUTTON.

Television Nomenclature

WITH a view to securing uniformity of practice and general understanding, the technical section of the Television Development Sub-Committee of the Radio Manufacturers' Association is urging all engineers concerned with, and manufacturers of, television equipment to employ a common form of nomenclature. Manufacturers are recommended to make use, so far as is possible, of the technical terms set out in Sub-Sections 108 and 109 of the B.S.I. glossary (No. 205—1936) in their literature and in any instructional classes they may conduct. In addition, the Association has issued a list of recommended markings for the controls on television receiving sets. The Association is also endeavouring to secure the co-operation of technical institutes which conduct radio engineering courses.

New Electrical Products

A review of equipment recently marketed

Portable Electric Ironer

A TABLE ironer of the roller type has lately been produced by H. & D., LTD., Forest Road, South Yardley, Birmingham.

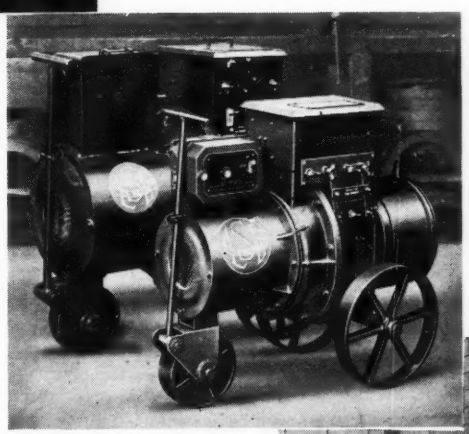
The machine, illustrated below, has a padded rotary roller and a fixed semi-circular metal heater housing a 900-W element. Operation is by an elbow lever which causes the roller to rotate and closes the iron on to the roller. One end of the ironer is open, enabling collars and cuffs to be ironed. The weight is 25 lb. and the base area is only 10 sq. in.

Welding Generator

A portable welding generator for work requiring lighter rods and a lower maximum current than does the original "K-S" model has been developed by LAURENCE, SCOTT & ELECTROMOTORS, LTD., Norwich. The "Series 10 K-S" machine gives the following outputs: 8 A at minimum steady setting; 160 A at 25 arc volts for continuous hand welding; 200 A at 25 arc volts for intermittent hand welding; 112 A at 25 V against resistance load for six hours with a 40 deg. C. rise, except for top field coil which has "Class B" insulation for 50 deg. rise.

The "Handee" table ironer

The generator consists of a rectangular frame to which are fitted at top and bottom the main poles. The latter incorporate commutating poles and are fitted with horns providing magnetic leakage paths to the side of the frame. Each of the main poles is wound with a series coil, the two being connected in parallel. When all the regulating resistance is in circuit, almost the whole of the current flows through the top coil and the output is limited by magnetic saturation and leakage. With all resistance out current flows in both coils and full output is obtained. This principle avoids the necessity for working on some settings with an unstable magnetic circuit, thus permitting positive and fine regulation of current with rapid voltage recovery and freedom from reversal of polarity.



"Series 10 K-S" welder with a "Series 20" machine behind

The detachable regulator has links which provide for current ranges of from 8 to 18, 18 to 42, and 40 to 200 A by means of hand-wheel adjustment. It is claimed that the method of pre-set control prevents the current setting from being affected by voltage or frequency or by temperature changes as the set warms up. Two machines can be operated in parallel to share the load equally without exact setting of the regulators.

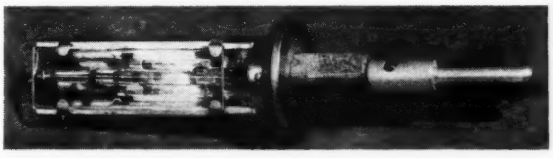
In the standard model the generator is driven by a squirrel-cage motor, the stator of which is connected in star when currents not exceeding two-thirds of the maximum are required. The generator can, however, be driven from any source at 3,000 RPM if the variation over the load range does not exceed ±6 per cent. The set, which weighs 560 lb., is transportable. DC models are available.

The Ferranti diathermy equipment in use

Discharge Lamps for Cinema Projectors

The application of high-pressure mercury vapour discharge lamps to cinema projectors is claimed by PHILIPS CINE-SONOR, 147, Wardour Street, London, W.1, to be advantageous in several respects, chief of which are much increased light output, small dimensions and almost entire absence of heat.

The lamp is a quartz tube, 2½ in. long and of quite small diameter, with an electrode sealed into each end. The discharge strikes immediately voltage is applied, and the lamp reaches full operating brilliance as rapidly as the ordinary domestic incandescent lamp.



The Philips discharge lamp for cinema projection

The discharge is stable and the luminosity evenly distributed, while the use of DC eliminates the flicker which would be caused by the "beat" between the projector shutter and lamp if it were operated from an a.c. source; the input is only one kVA. The projector and its light source are mounted on a circular plate, which can be rotated about its horizontal axis to adjust the vertical angle of the throw.

The space usually taken up by the lamp-house is thus left clear to accommodate the spool boxes, which are arranged in line behind the projection unit, and the complete assembly is mounted on the side of a cabinet which contains the photocell amplifier, driving motor and so on. The horizontal dimension is about the same as that of a typical projector employing an arc lamp, but the vertical dimension is so small that it is possible to mount two projection units, one above the other, on top of the amplifier cabinet.

The amplifier cabinet, which is of strong rectangular metal construction, houses the amplifiers, their power supplies, controls and monitor loudspeaker. The fact that all speech wiring is contained inside the cabinet ensures good screening and short speech connections.

Short-wave Diathermy Apparatus

A short-wave diathermy machine is announced by FERRANTI, LTD., Radio Works, Moston, Manchester, 10. The set operates at 11 metres wavelength instead of 6 metres, as usually adopted. The makers state that no loss of therapeutic effect has been detected due to this change, though control is said to be simplified and efficiency improved; in addition, a wider range of electrodes can be used.

The maximum power output is about 300 W and a single-valve Hartley circuit is employed. Coupling between the patient and the oscillator circuits is variable, so that full output can be obtained for a wide range of treatments involving differing patient impedances. A watt-hour meter is fitted for estimation of valve life.

The set is supplied in a screened cabinet, walnut finished with black panel and ventilating louvres and chromium-finished fittings. There are only three controls, on-off switch, resonance and coupling respectively. The panel is also provided with a red pilot light and an anode current meter.

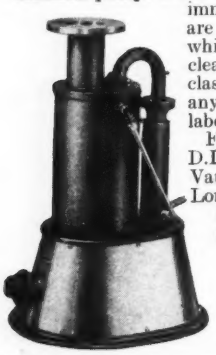
The electrodes available are three sizes of the flat rubber variety, an induction cable and a cup type for treating boils.

The cabinet door is fitted with a safety switch, and the patient coil is coupled inductively to the oscillator anode coil and mechanical stops prevent the two touching. As a further precaution the anode side of the oscillator is earthed, leaving the filament at high potential and the electrodes are tested to 10,000 V for 2 min.

D

High Vacuum Pumps

High vacua can be created more quickly when mercury diffusion pumps are used for exhaustion than when rotary oil-immersed pumps are employed. There are no moving parts in the mercury type, which is robust and readily dismantled for cleaning. British-made pumps of this class are now available suitable for almost any requirements from small scale laboratory work to industrial needs.



Mercury pump combined with small auxiliary vapour pump

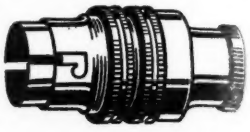
Five sizes are fully described in list D.I.F.1 just issued by W. EDWARDS & Co., Vaughan Road, Loughboro' Junction, London, S.E.5, for pumping speeds of from 2 to 180 litres per second. They are all guaranteed to produce an ultimate vacuum below 10^{-6} mm. Hg. when operated in conjunction with a rotary backing pump, since the diffusion principle can only be usefully applied to the reduction of pressures less than 10^{-1} mm.

The quantity of mercury used ranges from 20 to 300 c.c. according to size of pump, and for vaporising it a 150 to 850 W heating element is so clamped to the pump boiler as to make replacement simple. A gas burner may be used instead. A water-cooled jacket surrounds the mercury condenser, but should operating circumstances render condensation insufficiently rapid to prevent vapour passing from the pump into the system being exhausted, then a trap may be interposed with its inner portion filled with liquid air, or a mixture of solid carbon-dioxide in acetone or trichlorethylene. Trap capacities range from 200 to 2,000 c.c.

When the system to be exhausted is all-metal the pump is usually bolted directly thereto by waxed or greased flat flanges; alternatively, adaptors are provided for making glass tube connections. The weights range from 3 to 80 lb. The larger mercury pumps may (as illustrated) be combined with a small auxiliary vapour pump in order to reduce the dimensions and cost of the associated rotary backing pump (not shown).

A Heavy-duty Lampholder

The "T.A." heavy-duty lampholder of SPERRYN & Co., Moorsom Street Works, Birmingham, 6, is intended for application where lamps, especially those of high power, are used in confined spaces or enclosed lighting units and there is frequent lamp failure through overheating of the lampholders.



The "Sperryn" lampholder

In the "Sperryn" holder chisel-edged contacts are employed. Pressure is supplied by a single helical spring which does not carry current and the inner brass sleeve is fixed to the insulating block, forming an integral unit piece. This sleeve is slotted to correspond with the lamp pins.

The lampholder can be supplied in weatherproof form for two- and three-pin lamps taking up to 10 A, and has also definite anti-vibration properties.

Meter-testing Sets

FOR testing meters FERRANTI, LTD., have produced a three-phase set suitable for testing each phase individually, and available in 100-, 500- and 1,000-A ratings. A moving-coil regulator is fitted in each current and voltage circuit. By means of the lead screw motion, coarse and fine adjustment can be obtained on each regulator.

Group control of power factor is obtained by means of a three-phase shifting transformer inside the framework, operated through suitable gearing by a handle on the front panel, but an additional small p.f. adjustment is provided in each phase to obtain an absolute balance of p.f. on varying load conditions. Facilities are also provided to obtain p.f.s of 0.5 lagging on each phase by displacing the current circuit 60 deg. with respect to the pressure circuit. It is therefore possible to test meters at unity power factor on one or two phases and at 0.5 p.f. lagging on other phases.

One ammeter and one voltmeter are provided in each phase, with switches to change the ranges of the voltmeters simultaneously; also to connect the voltmeters phase-neutral or phase-phase. Three-phase, four-wire and single-phase p.f. indicators are fitted on the panels with switches to connect the single phase indicator into any phase. The current transformer ratio switches are arranged so that the ranges on the current supply transformer and the precision current transformer are changed simultaneously. The sub-standard wattmeters are placed in a well, over which a plate-glass cover is fitted, and the illumination of the well is provided by lamps and reflectors mounted above.

On one side of the set are fitted three interlocking switch-plug sockets connected in the secondary circuit of the precision current transformer. These are used for connecting the current coil of the rotating sub-standard meter in this circuit, and are so arranged that the switch cannot be opened unless the plug is inserted in the socket and the plug can only be withdrawn when the switch is in the closed position. Alongside the set is a wooden meter bench of robust construction.

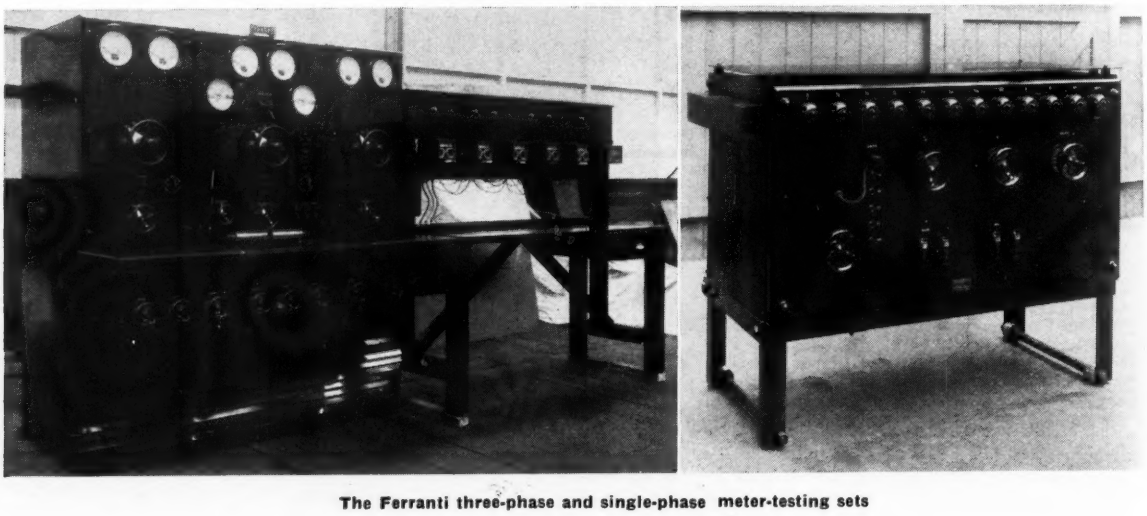
A single-phase set for testing meters up to 100 A and 500 V consists of an angle-iron frame mounted on rollers with front slate panel.

In the current circuit a multi-tapped current supply transformer is provided, and the load control is obtained by means of a sectionalised resistance bank, each section being arranged to give approximately a certain percentage of full load current such as 50, 25 and 10 per cent. Tumbler switches control each section of resistance. This percentage of load current will be obtained on whatever current tapping is used on the current transformer. Two slide wire resistances give a fine adjustment of load current. For testing meters at p.f. 0.5 lagging, a variable inductive resistance is provided.

The set is capable of being fitted under the meter bench, therefore it does not occupy additional space in the test room. It is primarily intended for testing meters against a rotating sub-standard meter, but with the addition of a precision current transformer and sub-standard indicating wattmeter stop-watch tests can be taken against these.

The DC (ampere-hour) meter-testing set also comprises an angle-iron frame with front slate panel. The supply for this set is usually obtained from a 10-20 V battery.

Current control is obtained by means of variable resistances and a sectionalised fixed resistance bank, each section being controlled by a tumbler switch. Four graded variable resistances are provided. Mounted on the horizontal panel is a sub-standard milli-voltmeter which operates in conjunction with a universal shunt. A regulator switch is provided to select the range required on the universal shunt. A voltmeter is mounted on the panel to indicate the battery voltage.



The Ferranti three-phase and single-phase meter-testing sets

British Overseas Electrical Trade

In November the value of electrical equipment exported from this country exceeded £2,000,000 for the first time for many years.

ALL the major classifications of electrical exports contributed to the third consecutive monthly increase in value which brought the total for November to over £2,000,000 for the first time since 1926. The Board of Trade returns also disclose an improvement in British exports generally, but while the monthly values have remained below those of last year since January electrical exports have been consistently greater than in 1937. Last month's total of £2,021,085, for instance, was £298,555 (17 per cent.) more than that for November, 1937, and it is interesting to observe that shipments of goods and apparatus, which had fallen off in the previous two months, were up by £95,415.

TABLE I.—EXPORTS AND IMPORTS DURING NOVEMBER.

	Exports. Nov., 1938.	Exports. Inc. or dec. compared with Nov., 1937.	Imports. Nov., 1938.	Imports. Inc. or dec. compared with Nov., 1937.
Submarine telegraph and telephone cables	£22,723	+ £22,187	*	—
Telegraph and telephone wires and cables (not submarine)	72,260	— 10,732	*	—
Other insulated wires and cables	277,764	— 14,999	£27,895	— £9,281
Radio receivers, not radiograms (excluding valves)	74,382	+ 34,392	12,608	+ 1,680
Radio transmitters (excluding valves)	19,335	— 11,921	*	—
Radio valves	63,582	+ 19,544	14,741	— 3,269
Other radio parts and accessories	48,350	— 85	61,468	— 13,668
Telegraph and telephone apparatus (other than radio)	295,776	+ 59,598	*	—
Electric carbons	*	—	10,119	+ 1,686
Incandescent lamps	52,458	— 3,662	7,082	— 5,655
Other lighting apparatus	52,555	+ 2,827	44,498	— 12,547
Primary batteries	14,742	— 1,357	*	—
Accumulators	45,845	+ 875	*	—
Electric cooking and heating apparatus	33,051	— 1,860	*	—
House service meters	15,113	+ 147	*	—
Other electrical instruments	30,777	+ 119	37,043	+ 4,613
Insulating materials not elsewhere specified	24,650	+ 7,419	*	—
Unenumerated electrical goods and apparatus	115,305	— 7,077	70,594	— 10,507
Electric generators up to 200 kW	49,672	+ 17,942	*	—
Electric generators over 200 kW	186,875	+ 92,874	*	—
Electric motors	152,690	+ 18,867	19,185†	— 7,223
Convertors and transformers	65,704	— 14,906	*	—
Starting and controlling gear for motors	47,781	+ 8,149	*	—
Switchgear	218,236	+ 79,446	*	—
Other electrical machinery	17,484	+ 5,300	16,135	— 6,516
Electric vacuum cleaners	23,978	— 4,532	10,790	— 5,856
Total	£2,021,085	+ £298,555	£332,158	— £66,543

* Not classified separately. † Not railway and tramway motors.

The principle increases, however, were still in the machinery section. The growth of overseas purchases of generating plant made in this country is illustrated by the trend of exports during recent months: August, £130,342; September, £151,382; October, £178,212; and November, £236,547. Last month's shipments were worth £110,816 more than a year ago, and their volume increased from 729 to 1,335 tons. The chief destination was British India, to which plant worth £51,751 was sent. Much more generating equipment than usual was dispatched to foreign countries (total value £60,872). Another type of plant exported to a greater extent recently is switchgear. The quantity sent abroad last month (896 tons) was greater than in any previous month this year and compared with 634 tons in November, 1937. Exports of motors last month totalled 901 tons compared with 826 tons a year ago.

Among goods and apparatus the larger overseas demand for radio sets is noteworthy, the value of £74,382 being by far the highest attained this year. The number of sets, excluding radiogramophones, sent to overseas markets last month was 15,453 against 7,283 in November, 1937. Exports of valves also rose exceptionally, from 159,391 to 314,230, with an increase in value from £44,638 to £63,582. There was, however, a fairly substantial contraction in exports of transmitters.

After rising to £302,009 in October, exports of wires and cables (other than telegraphic and telephonic) decreased to £277,764 in November, but comparison with last year is less unfavourable. The following analysis gives the principal destinations, with values for last month and November, 1937 (in parentheses):—

Rubber insulated wires and cables:—Australia, £35,828 (£42,923); British India, £28,342 (£14,787); South Africa, £16,203 (£23,398); New Zealand, £11,854 (£13,348); other British countries, £21,023 (£21,513); and foreign countries, £24,647 (£13,021). Ditto, insulation other than rubber:—South Africa, £33,561 (£34,503); Australia, £28,768 (£36,210); British India, £27,391 (£27,043); other British countries, £36,343 (£42,437); and foreign countries, £13,804 (£23,580).

In spite of meagre exports of telegraph and telephone apparatus to Argentina, usually a substantial buyer, total exports of this type last month showed an increase of £59,598 over November, 1937. The following is an analysis of the chief destinations, with comparative values:—Australia, £44,284 (£71,799); South Africa, £29,633 (£29,599); other British countries, £92,746 (£47,368); Argentina, £844 (£31,458); and other foreign countries, £128,269 (£55,954).

While exports were 17 per cent. more than a year ago imports were equivalently less. The total of £332,158 was also below that for October (£351,934). Up to the present this year electrical instruments alone have been imported more freely than last year, with a total value for the eleven months of £349,722 against £297,837. In November imports of this type were worth £37,043, somewhat less than in recent months. Imports of radio receivers last month were of a higher value than a year ago which, together with the large increase in exports, seems to indicate an improvement in market conditions for this type of apparatus.

The following analysis of electrical goods and apparatus imported into this country last month shows that the United States was easily the chief supplier, Germany, which has at times held this position, being well behind (the values in parentheses are for November, 1937):—United States, £97,103 (£95,048); Germany, £64,776 (£76,061); Netherlands, £44,066 (£56,598); Belgium, £18,722 (£15,583); Switzerland, £18,628 (£18,275); France, £8,648 (£9,993); Austria, £3,879 (£6,164); other foreign countries, £19,241 (£40,674); and British countries, £10,985 (£14,600). Total, £286,048 (£332,996).

TABLE II.—BRITISH ELECTRICAL EXPORTS DURING NOVEMBER.

Destination.	Goods and apparatus, Nov., 1938.	Inc. or dec. compared with Nov., 1937.	Electric generators, Nov., 1938.	Inc. or dec. compared with Nov., 1937.	Electric motors, Nov., 1938.	Inc. or dec. compared with Nov., 1937.	Other electrical machinery, Nov., 1938.	Inc. or dec. compared with Nov., 1937.
Eire	£51,104	+ £1,192	*	—	*	—	*	—
Channel Islands	13,123	— 253	*	—	*	—	*	—
Palestine	15,683	— 2,853	*	—	*	—	*	—
British West Africa	16,410	+ 3,135	*	—	*	—	*	—
Union of South Africa	169,556	+ 5,290	£41,943	— £19,291	£28,692	— £3,316	£104,294	+ £34,905
British India	129,650	+ 16,550	51,751	+ 43,833	19,003	+ 4,700	40,616	+ 8,984
British Malaya	44,966	+ 10,853	*	—	*	—	21,486	+ 7,981
Ceylon	17,723	+ 3,966	*	—	*	—	*	—
Hong Kong	16,141	+ 1,050	*	—	*	—	*	—
Australia	153,998	— 68,321	24,605	+ 11,427	22,318	+ 6,977	26,661	— 1,591
New Zealand	119,189	+ 44,147	*	—	10,663	— 3,452	19,162	+ 7,212
Canada	33,590	+ 21,030	12,037	+ 10,060	10,285	+ 1,664	6,036	+ 93
Other British Countries	55,081	+ 3,953	45,339	+ 14,604	16,117	+ 2,079	41,959	— 8,405
Sweden	28,160	+ 7,832	*	—	*	—	*	—
Denmark	14,071	— 3,645	*	—	*	—	*	—
Netherlands	30,334	+ 10,918	*	—	*	—	5,686	+ 3,495
Belgium	7,337	— 7,269	*	—	*	—	*	—
France	19,550	+ 9,000	*	—	*	—	2,816	— 79
Portugal	8,972	+ 6,097	*	—	*	—	*	—
Spain	9,419	+ 8,262	*	—	*	—	*	—
Italy	2,916	— 847	*	—	*	—	*	—
Greece	2,117	— 3,487	*	—	*	—	*	—
Rumania	11,876	+ 942	*	—	*	—	*	—
Egypt	20,599	— 2,582	*	—	*	—	750	+ 442
China	4,633	+ 3,606	*	—	*	—	5,317	+ 5,317
Brazil	6,614	— 20,415	*	—	*	—	*	—
Argentina	22,949	— 54,328	*	—	*	—	18,214	+ 16,644
Other Foreign Countries	232,907	+ 101,592	60,872	+ 50,183	45,612	+ 10,215	56,205	+ 2,991
Total	£1,258,668	+ £95,415	£236,547	+ £110,816	£152,690	+ £18,867	£349,202	+ £77,989

* Not classified separately. Vacuum cleaners are included in Table I but not in Table II.

New Books

Electric Power Circuits, Theory and Applications. Vol. II. Power System Stability. By O. G. C. DAHL. (Pp. 698, illus.). London: McGraw-Hill Publishing Co., Ltd. Price 2 gns.

VOLUME I of this treatise was published in 1928 and dealt with short-circuit calculations and steady-state theory. The present volume deals solely with system stability and the magnitude of this problem in the United States is indicated by its having 700 pages devoted to it.

The introductory chapter gives a good account of the origin of the stability problem and defines the terms used. The main body of the book is divided into two approximately equal sections dealing with steady-state, and transient stability. In both sections the same general line of treatment is followed: simple circuits are considered first, and thereafter the analysis of complex systems is approached by easy stages.

Numerous worked examples are given which should be of assistance to the engineer in solving any stability problem with which he has to deal. Both analytical and graphical methods of analysis are developed, and the use of power angle curves is well illustrated.

In connection with transient stability a chapter is included dealing with the sequence networks for faulty systems. The use of the AC network analyser in power limit and stability determinations is also discussed, while a detailed treatment is given of the action of voltage regulators and the effect of damper windings.

Although the book is self-contained, it is probably best used in conjunction with Volume I as it contains many references to the methods developed in that volume.

While stability is a major factor in the design of American systems involving long transmission lines, it is not so in this country; *e.g.*, the British 132-kV system, takes the form of a relatively solid network of low impedance interconnectors. Nevertheless, stability problems do arise in Britain as when under emergency conditions it is necessary to parallel two large systems by means of a high reactance tie-line. The electrical engineer in this country should therefore find the book extremely valuable for reference (although it is primarily intended as a college text book) as even when stability problems as such are not involved, a knowledge of the technique employed in their solution leads to a clearer understanding of the fundamental principles of power system operation. The production of the book is of a high standard.—J. S. F.

Transformer Engineering. By L. F. BLUME, G. CAMILLI, A. BOYAJIAN, and V. M. MONTSINGER. Edited by L. F. BLUME. (Pp. 509; figs. 355.) London: Chapman & Hall, Ltd. Price 25s.

This book by members of the Transformer Engineering Department of the American General Electric Co., is confined to the theory, operation, and application of transformers. It touches upon design only with a view to supporting solutions of problems relating to operation, in connection with which mathematics has been employed freely, although, primarily, stress is laid upon the physical approach as offering a more acceptable mode of presentation.

After an introductory discussion of the general nature of transformer problems, two chapters deal with excitation characteristics embracing excitation current, core loss, current rushes, harmonics, and resonance phenomena, and two more with a study of impedance characteristics for transformers having two or more windings. These are of interest to the user as showing the elaborate technique required to predetermine this apparently simple feature of design.

The next chapter discusses short-circuit currents and voltages by the method of symmetrical components, and gives applications for the usual types of system faults encountered and diagrammatically illustrated tables of transformer zero-sequence reactance.

In sections relating to the operating characteristics of various connections for single-phase and three-phase units and groups, both double- and auto-wound, the delta-delta and vee-vee connections (which are in much more common usage in the United States) receive, to the British way of thinking, a little too much consideration. Of special note is the treatment of the interconnected-star earthing transformer.

Under the heading of "Thermal Characteristics of Transformers" are included many useful heating data relating to surfaces, materials and structures cooled in different ways, and also to the temperature rise of cables and the transient heating of windings, together with a useful guidance for operation

Other chapters deal with the characteristics of transformer circuits for changing ratio under load (with typical diagrams), automatic voltage-control equipments, principles of system phase-angle control, and (more briefly) the characteristics of insulating materials used, including electrical stress, frequency, time, temperature, dimensions, electrode shape, impurities, commercial frequency and impulse voltages. A description of the voltage stresses which may be imposed upon star-connected auto-transformers by different operating conditions is interesting technically, but has more application in America than in Great Britain.

The last two chapters and the appendix end the book on a truly modern note. They describe the transient voltage characteristics and the insulation co-ordination of transformers and the 60-cycle and impulse flashover of rod gaps and present data obtained from the considerable laboratory and field research carried out in the United States. These, however, are useful mainly as guides rather than as definite recommendations, although a table gives recommended standard insulation test levels for distribution and power transformers up to rated circuit voltages of 345 kV.

This book is the most important contribution of recent years to the literature of transformer operation, and pays an effective tribute to the value of expert co-operation. It should be in the possession of all having a primary interest in transformer engineering, whether from the design or operation standpoints. —S. A. S.

Automatic Telephony. By C. W. WILMAN. (Pp. 208; figs. 103.) London: The Technical Press, Ltd. Price 10s. 6d.

Progress in the art of automatic telephony is both rapid and continuous, and in preparing this book for the second edition the author has done valuable work in bringing it up to date with current practice. A large number of illustrations has also been added, but what is of equal importance is that the nomenclature employed and symbols used conform in general to those laid down by the British Standards Institution and adopted by the British Post Office.

The author has aimed at dealing in an elementary manner with the principles underlying the complexities of automatic telephony and has succeeded admirably, the subject matter being presented in a concise and readily comprehensible manner. Nevertheless, the scope of the work is wide, embracing aspects varying from an elementary conception of the remote control of switches to an outline (including schematic circuit diagrams) of the "director" system employed in large cities, such as London. While attention is focused on the principles of the step-by-step system standardised by the G.P.O., which is necessarily of considerable importance to students of telephony in this country, reference is also made to alternatives which are possible.

To indicate briefly the comprehensive nature of this work: chapters are included on elementary trunking principles, traffic theory, relays and their time elements, impulsing problems, selector mechanisms, line switches and line finders (including partial secondary working), group and final selectors, inter-exchange connections, miscellaneous circuits, small automatic exchanges, &c. The method adopted in describing the main switching circuits employed in the step-by-step system is to be commended, the facilities provided, circuit elements, and skeleton diagrams of complete connections being given separately. The value of this method would have been enhanced, however, had at least one complete selector circuit diagram been included to indicate the manner in which the circuit elements are combined to form a complete circuit.

To students of automatic telephony, more particularly the beginner, this work is highly recommended.—H. E. W.

National Certificate Mathematics. Vol. I by ABBOTT and KERRIDGE; Vol. II by ABBOTT and MARSHALL; Vol. III by ABBOTT and MAHON. London: The English Universities Press, Ltd. Vol. I (Pp. 338; figs. 119), price 6s. net; Vol. II (Pp. 314; figs. 98), price 7s. 6d. net; Vol. III (Pp. 342; figs. 109), price 7s. 6d. net.

These three excellent volumes constitute a complete work for technical college students for the purpose stated in their title and also cover the syllabus in mathematics for students taking a three-year course in either electrical or mechanical engineering.

While it is questionable whether the boy who is admitted to any of our technical colleges as a first-year student has no knowledge whatever of either algebra or trigonometry, the authors work on this assumption, and in Vol. I we find that, after a few preliminary revision exercises in arithmetic (the working of which is not given) the rules of algebra are explained from first principles. Thence the authors proceed fairly rapidly until at the end of this volume the theory of indices with its application to logarithms as well as the simple trigonometrical ratios have been dealt with. While certain parts of this volume may appear elementary they can be regarded in the light of revision, particularly as there is a series of carefully graded exercises at the end of each chapter in which practical engineering problems are kept in the forefront.

The second volume likewise contains certain sections which can be regarded as being the revision of what was done in the first year, and thence the student is led through the study of series and expansions until the elementary conception of the differential calculus can be given. Volume III also includes the necessary amount of revision of the work of the second year and then proceeds to deal with the harder theories of the differential as well as with the integral calculus. Throughout the work the particular requirements of the engineering student have been kept in view and a welcome use is made of graphical methods. We can recommend these volumes not only to the college student for whom they are primarily written but to the older engineer who may feel the urge to revise, in a congenial manner, his rusty mathematics.—A. R.

In the Courts

Rating of C.E.B. Property

A PENDING High Court appeal in which the rating authority of Barking and the Central Electricity Board are concerned was mentioned on a motion for extension of time which came before the Lord Chief Justice and Justices Charles and Humphreys, sitting as a King's Bench Divisional Court last week.

Counsel representing the rating authority explained that the matter arose in connection with an appeal which had been heard at Quarter Sessions. The appeal raised questions of great complexity regarding the rating of the Central Board's undertaking, and Quarter Sessions had agreed to state a case for the opinion of the High Court. The case had not yet been agreed between the parties and at the moment it was before those advising the Board. Counsel asked that the time in which to state the special case should be extended for three months from December 15th, when the time normally expired. The case raised a question as to whether the Board's undertaking should be assessed on a profits basis.

Counsel appearing on behalf of the Central Board expressed his agreement with the application and remarked that the case was one of "most appalling" complexity.

The Court extended the time for three months.

Sequel to Cable Accident

At Manchester last week Mr. Justice Croom-Johnson heard a claim for damages by Mr. John Madden, a labourer, against Rochdale Corporation. It was stated for the plaintiff (according to the *Manchester Guardian*), that he was in the employ of a firm of road contractors who were employing an excavator lent by the Corporation. The machine brought up an electric cable and Mr. R. Clegg, a mains assistant employed by the Corporation, was called. He went to a sub-station and then, stating that the cable was "dead," commenced to cut it with a hack-saw. Then he handed the saw to the plaintiff and asked him to "have a go." When plaintiff had sawn a little further there was a flash and his left hand was badly injured. He had been unable to work since the accident. A medical witness said that plaintiff had become a typical neurasthenic. He did not think that the hand would improve in the future and plaintiff would be unable to do any laborious work.

Counsel stated that special damages to date had been agreed at £133 10s. It was also agreed that the plaintiff's earning capacity was limited to £1 a week meaning a weekly loss of £1 10s.

Mr. W. Gorman, K.C., for the defendants said that Mr. Clegg had not needed any assistance, but seeing the plaintiff anxious to assist passed the hack-saw to him.

Mr. Clegg said that he did not deem it necessary to have assistance in cutting the cable and he had no authority for Madden to give him assistance.

The Judge, referring to the Corporation's defence, said that at that stage of the case he did not see how Clegg could be held to be in the same common employment. He would reserve judgment pending legal argument.

Parliamentary News

(BY OUR SPECIAL REPORTER)

Local Authorities' Purchase Option

IN the House of Commons on December 14th Mr. Bracken asked the Minister of Transport whether, in view of the Government's decision to postpone legislation for the reorganisation of electricity distribution, he would consider the advisability of making arrangements to suspend the options held by a number of local authorities to take over orders held by private undertakings until Parliament had an opportunity of considering a comprehensive scheme for the future regulation of electricity distribution.

Mr. Burgin said he would consider any arguments which might be put before him as to the need for some special action, together with any views which the purchasing authorities themselves might desire to submit to him upon any such proposal.

Supply in Scotland

Mr. Gibson asked the Minister of Transport how many local authorities and companies, respectively, in Scotland supplied electricity to the public.

Mr. Burgin said that thirty-six public authorities and thirty companies were supplying electricity to the public in Scotland under statutory powers.

Sanction for Loans

Mr. Ridley asked the Minister of Transport whether he was aware that the continued delay on the part of the Government in failing to introduce legislation for the reorganisation of electricity distribution was seriously hampering local authorities because of the refusal of the Electricity Commissioners to sanction loans for the normal development and extension of publicly-owned undertakings; and whether he was now in a position to make a definite statement as to the Government's intentions.

Mr. Burgin said he was not aware of any grounds for the suggestion that the Electricity Commissioners were refusing to sanction loans for the normal development and extension of publicly-owned electricity undertakings. He would be glad if the hon. member would give him the facts of any case where it was alleged there had been such refusal. As regarded the last part of the question he would refer the hon. member to the reply given by the Prime Minister on November 10th.

Supply in East Anglia

Colonel Heneage asked the Minister of Transport if his attention had been called to the fact that the parishes of Bigby, Grasby, Somerby and Searby-cum-Owmby were still without an electricity supply, although it had arrived at Caistor; and if, in view of the usefulness of electricity for agricultural and domestic purposes, he would take any steps in the matter.

Mr. Burgin said he had asked the Electricity Commissioners to make inquiries and he would advise his hon. friend of the outcome.

Broadcast Relay Exchanges

On December 19th Mr. Fleming asked the Postmaster-General whether the wire broadcast relay system operated by the General Post Office had increased the number of its subscribers during the past 12 months; and what percentage of the number of wireless licence holders those subscribers represented.

Major Tryon said that the wire broadcast relay exchanges were at present operated not by the Post Office, but by private concerns under licence. During a recent period of twelve months the number of subscribers increased by 2,130. They now represented 2.85 per cent. of the total number of wireless receiving licence holders.

Traffic Lights

Mr. Remer asked the Minister of Transport how many pedestrian crossings, fitted with the ray apparatus similar to that established on the Sutton by-pass, had been installed in England; whether this apparatus was experimental; and if he would state the results of those experiments.

Captain Austin Hudson said that five traffic light signal installations employing ray detector apparatus had been provided in different parts of the country. Experience with this type of apparatus had led the Minister to the conclusion that installations of the normal type were to be preferred.

Anglo-American Trade

B.E.A.M.A. Statement

IN our issue of November 25th we gave some details of the Anglo-American Trade Agreement which was signed in Washington on November 17th.

We have now received a statement from the British Electrical and Allied Manufacturers' Association reviewing the effects of the agreement upon the British electrical manufacing industry. This says that in attempting to assess these effects two aspects have to be considered. (1) That of the home market and (2) the position of British electrical manufacture as a major exporting industry. In the home market concessions have been granted on twelve classes of electrical goods. Under the operation of the most-favoured-nation clause concessions made to the United States are also applicable to other nations, and this is a handicap to British industry which brings with it no corresponding advantage. As a result of the reduction in the import duties on these goods intensified competition will be experienced in the home market from a number of countries. The reduced duties on vacuum cleaners and refrigerators will have a discouraging effect both on our home market and our capacity to export. On these products British manufacturers have expended large sums in development and were just beginning to reap the benefits of earlier efforts.

As the United Kingdom electrical industry is not, and does not seem likely to be, a serious competitor in the United States market, the concessions made to United Kingdom electrical exporters are of doubtful value.

In the Colonial markets of the Empire a number of electrical items are also affected. In these markets the United Kingdom electrical industry has received a definite setback. In many instances the margins of preference hitherto enjoyed by the British manufacturer have been reduced, thus intensifying the already keen competition in these countries.

In such an agreement, the statement concludes, it is inevitable that there should be sacrifices on the part of some industries in order that other industries may obtain advantages. The British electrical manufacturing industry recognises that the Anglo-American Trade Agreement represents a great achievement on the part of those responsible for it, and hopes that a freer movement of trade and greater prosperity will result.

Engineers' Wage Claim

The engineering employers rejected on December 6th the demands of the trade unions for wage increases and the restoration of pre-1931 conditions of payment for piecework, overtime, and night-shift work. At meetings of representatives of the A.E.U. and the National Union of Foundry Workers and unions comprised in the Engineering Joint Trades Movement, Sir Alexander Ramsay, director of the Employers' Federation, explained that although there was increased productivity in armaments, the industry generally could not contemplate a further increase in labour costs.

Personal and Social

Information regarding new appointments and other matters of interest for this page are welcomed

THE West Midlands Joint Electricity Authority has appointed **Mr. L. F. Jeffrey,** B.Sc.(Eng.), to the position of deputy chief engineer. Prior to this appointment Mr. Jeffrey was engaged as technical assistant and constructional engineer with the Authority, and he was for a number of years chief assistant constructional engineer to the Birmingham Corporation Electric Supply Department. Mr. Jeffrey, who was educated at Whitgift School, Croydon, and the University of London (Battersea Technical College) received his practical training with Jas. Keith & Blackman Co., Ltd. He is a corporate member of the Institutions of Civil, Mechanical and Electrical Engineers and has served as chairman of the Midland Section of the Junior Institution of Engineers.

A recent appointment in the G.E.C. is that of **Mr. R. C. Giggins** to the administrative staff of its Government and Railways Department. The activities of this department have increased very considerably during the past few years, and present conditions have made it busier than ever before. Mr. Giggins has been with the G.E.C. for twenty-four years. Since 1929 he has been general manager of the company's organisation in Malaya, where he was one of the pioneers and later chairman of the British Malaya Broadcasting Corporation.

Mr. R. C. Giggins

Sir Everard Pauncefort-Duncombe, Bt., D.S.O., D.L., has been elected a director of the Northampton Electric Light & Power Co., Ltd., in place of the late Mr. R. E. Lamb.

The examining board has now announced its decision in connection with the W. E. Highfield Shield Competition, 1938, held under the auspices of the Association of Supervising Electrical Engineers. The awards are as follows:—Members' Section: Winner of the shield and first prize of £5 5s., Mr. W. J. Spencer, London, for his paper, "Control of Street Lighting, &c., by means of Superimposed Impulses." Second prize (£3 3s.), Mr. P. A. Shackleton, London, for his paper, "Adapting Steam-heated Ovens for Electric Heating in the Confectionery Trade." Third prize (£2 2s.), Mr. G. A. T. Burdett, London, for his paper, "Administration and the Electrical Engineer." Associates' prize (£3 3s.), Mr. H. Atkins, Coventry, for his paper, "Some Notes on the Installation, Operation and Maintenance of Electric Pyrometers." The shield and prizes were presented to the successful competitors by the president of the Association, **Mr. J. R. Beard,** M.Sc., M.I.E.E., at the Association's meeting held at the Lighting Service Bureau on December 20th. The examining board was composed of Mr. J. R. Beard (president), Mr. J. S. Highfield (past president), Mr. J. M. Crowdy (past chairman of the Association), and Mr. W. Lang (a past member of the Executive Council).

Mr. S. G. Roper has been appointed distribution sales engineer to the North Wales Power Co., and its associated company, Electricity Distribution of North Wales and District, Ltd., and takes up his new duties on January 2nd. Mr. Roper has been engineer and resident manager of the East Suffolk Electricity Distribution Co., Ltd., for the last five and a-half years, previous to which he was distribution engineer to the West Hampshire Electricity Co., and before that distribution engineer to the South Somerset Electricity Co. He is at present vice-president of the Ipswich and District Electrical Association, and was chairman of the Association during the year 1937-38.

Mr. S. G. Roper

Mr. H. E. Wimperis, C.B., C.B.E., has been appointed president of Section G (Engineering) of the British Association, and **Dr. A. P. M. Fleming,** C.B.E., President of the I.E.E., has been appointed president of Section L (Education). The annual meeting of the Association will be held next year in Dundee from August 30th to September 6th.

Baxter & Caunter, Ltd., were in festive mood on December 14th when their annual dinner was held at Pritchard's Restaurant, Oxford Street, W.1. Formalities were dispensed with and speech-making was of the briefest. **Mr. G. W. Kettlewell** (director), who presided, mentioned that the number present was considerably larger than in the previous year, and he hoped they would continue to increase their wide circle of trade friends, to whom he tendered seasonal greetings from the company. After an excellent dinner of Christmas fare the whole party proceeded to the Coliseum.

Since last year's performance of the annual symphony concert the orchestra of the Central London Electricity, Ltd., now under the genial direction of **Mr. J. Dow,** has made remarkable progress. Last week's concert at the Kingsway Hall, London, cannot be too highly praised; a great improvement in technique and interpretation was noticeable in the rendering of Beethoven's "Egmont" overture which was followed by a fine rendering of Schubert's "Unfinished" symphony. A number of songs were given by the choir, including a delicate rendering of German's "O Peaceful Night." Altogether the effort was a praiseworthy one and the success was due in no small measure to the patience, good humour and musical enthusiasm which Mr. Dow, the new conductor, puts into his work.

On December 8th **Mr. William McGeoch,** the managing director of the Birmingham Works of William McGeoch & Co., Ltd., celebrated his seventieth birthday, when the staff and employés made a presentation to him. The presentation was made by four of the oldest hands in the company whose total service amounts to 200 years. Mr. William McGeoch has been with the company for fifty-two years; Mr. G. Shale (chairman of the Works Welfare Society), thirty-five years; Mr. A. Newell (hon. secretary, Works Welfare Society), thirty-eight years; and Capt. Percy McGeoch, twenty-four years.

The presentation to Mr. W. McGeoch. (Left to right): Messrs. G. Shale and W. McGeoch and Capt. P. McGeoch and the four oldest hands, Messrs. W. Grayland, H. Jinks, W. Woodland and G. Lester

Mr. D. J. Hastings, district engineer with the Yorkshire Electric Power Co., Ltd., has been appointed to the position of mains engineer with the Calcutta Electric Supply Corporation, Ltd. Before joining the Y.E.P. Co. Mr. Hastings was with the Norwich Corporation Electricity Department and previously with the Great Yarmouth Corporation Electricity Department. He sails from England on December 31st.

Mr. G. E. Windeler, M.I.Mech.E., M.I.Mar.E., of Manchester, has been elected to succeed **Mr. T. Hornbuckle,** B.Sc., A.M.Inst.C.E., as president of the Diesel Engine Users' Association for the ensuing year. **Mr. A. K. Bruce** and **Major A. T. Evans** are succeeded by **Messrs. S. B. Freeman** and **A. J. Oates,** as members of the general committee. The Percy Still medal for the session 1937-1938 has been awarded to **Mr. H. V. Stead, M.Sc.**

A presentation has been made to **Lieut.-Col. R. P. Winter,** who has relinquished his post as commander of the Tyne Electrical Engineers R.E. (T.A.). The presentation was made by **Major B. H. Leeson,** the new commanding officer.

Mr. L. J. Hunt has been appointed a director of the Electric Construction Co., Ltd., in place of the late Mr. E. H. F. Reeves.

Mr. A. B. Cowen has been appointed chairman of the Southern Rhodesia Electricity Supply Commission in succession to the late Mr. A. R. Metelerkamp, who was killed recently in an aeroplane accident. Mr. Cowen is a Devon man who has been concerned with the construction of many power stations in South Africa.

Mr. L. Giacomuzzi, who has retired from the position of managing director of the Mid-Lincolnshire Electric Supply Co., Ltd., owing to ill-health, was born at Taranto, Italy, and received his training at the Royal Polytechnic, Milan. In 1923 he became district engineer to the Societa Adriatica di Elettricita of Venice, at Rovigo, and in 1929 he was appointed secretary to the chairman of that company. In 1931 he came

to this country to take up the positions of general manager of the Lincolnshire and Central Electric Supply Co., managing

Mr. N. F. Marsh

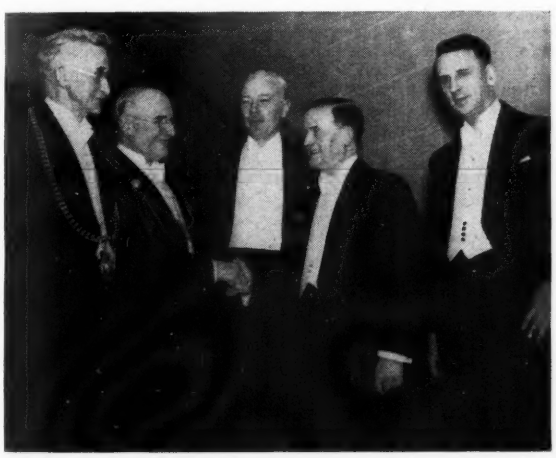
[*Elliott & Fry*

Mr. L. Giacomuzzi

director of the Mid-Lincs. Co., the Campbeltown & Mid-Argyll Electric Supply Co., Ltd., and the Thurso & District Electric Supply Co., Ltd., consultant to the Altrincham Electric Supply, Ltd., and general manager of Public Utilities (Electrical), Ltd. He has been a member of the I.E.E. since 1933, and is Ingegnere Industriale of the Royal Polytechnic, Milan.

Mr. N. F. Marsh, who has been appointed acting manager of the Mid-Lincolnshire Electric Supply Co., Ltd., graduated from Cambridge University, and afterwards served an apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., later joining the design staff of that company at its traction and motor works at Sheffield. He joined the Mid-Lincs Co. in 1932 as engineering assistant, and later in the year was appointed district engineer in charge of the company's newly formed Lincoln district. In the following year he was transferred to the company's office at Grantham in charge of a larger area and held this position until his recent appointment as acting manager. Mr. Marsh is also consultant to two associated companies, the Campbeltown & Mid-Argyll Electric Supply Co., Ltd., and the Thurso & District Electric Supply Co., Ltd.

The annual dinner of the North Eastern Centre of the Institution of Electrical Engineers was held at the Royal Station Hotel, Newcastle-on-Tyne, on December 7th, 1938. **Mr. F. A. Orchard** (chairman, N.E. Centre) presided, and among the guests were the Lord Mayor and the Sheriff, Dr. A. P. M. Fleming, C.B.E. (president I.E.E.), Col. K. C. Appleyard, Lord Eustace Percy (Rector of King's College, Durham University), Prof. W. M. Thornton, Messrs. J. S. Highfield, T. E. Allibone, C. R. Westlake, T. Carter, E. E. Grover (president, North of England branch, Association of Mining Electrical Engineers) and F. G. H. Bedford (managing director, C. A. Parsons & Co., Ltd.), Major J. W. Steel, city engineer, Newcastle-upon-Tyne, and Lt.-Col. S. E. Monk-



At the I.E.E. North-Eastern Centre dinner. (Left to right): The Sheriff and the Lord Mayor of Newcastle-upon-Tyne, Col. K. L. Appleyard, Mr. F. A. Orchard (chairman of the Centre), and Dr. A. P. M. Fleming (president of the I.E.E.)

house (general manager, North-Eastern Electric Supply Co., Ltd.). In proposing the health of the Institution, Colonel Appleyard said that throughout his experience he had seen abundant evidence of the spirit of friendliness which dominated the electrical industry, and urged that this spirit should be extended throughout technical institutions and to regular officers of the Royal Engineers. He said that in time of emergency the regulars would have to work with their ex-civilian brethren and that there was, therefore, great need of friendly contact with them in time of peace. He added that officers of the technical branches of the Army would welcome closer contact with the various institutions and urged these institutions to invite Army engineering officers stationed in the vicinity to their meetings, social or otherwise. In replying, Dr. Fleming said he was sure that if there was any way in which members of the Institution could assist in helping the nation in these difficult days, and after, that assistance would be forthcoming. The whole technical world knew the achievements of the great minds of Tyneside. They knew what had been accomplished in the way of new inventions. The district had given birth to such undertakings as the North-Eastern Electric Supply Co., Ltd., C. A. Parsons & Co., A. Reyrolle & Co., and the short-circuit testing station.

Mr. J. Stephen has been confirmed in the appointment of manager of the Lerwick electricity undertaking, and **Mr. J. Keith** has been appointed assistant manager.

Mr. E. Wilshaw, manager and director of Cable and Wireless, Ltd., has been appointed a Lieutenant of the City of London.

Mr. W. G. Turner, M.I.E.E., A.M.I.Mech.E., borough electrical engineer of Southampton, has taken a very active part in the recent developments of the local electricity undertaking which are described on page 891. Born in London in 1884, he was educated at Persse School, Cambridge, and Armstrong College, Newcastle-on-Tyne, and was apprenticed to C. A. Parsons & Co. at Newcastle. In 1905 he joined the Newcastle and District Electric Lighting Co., Ltd., and served on the works and mains staff until 1908, when he was appointed chief assistant engineer. He has been at Southampton since 1920.

Mr. W. G. Turner

Mr. F. N. Flight and **Mr. W. F. Knight** have been elected directors of the Rheostatic Co., Ltd.

Ald. H. K. Beale, of Birmingham, was re-appointed chairman of the South-West Midlands Advisory Joint Committee for the ensuing year at a meeting of the Committee held on December 8th.

Obituary

Monsieur E. Rousseau, whose death occurred recently at Charleroi, Belgium, at the age of fifty-eight, was managing director of the Société des Ateliers de Constructions Electriques, of Charleroi, with which undertaking he had been associated since 1909. **Monsieur G. Devillez** has succeeded him as managing director.

Mr. M. Levenger.—We regret to announce the death of Mr. M. Levenger, manager of the wire and cable, conduit and wiring sundries departments of the General Electric Co., Ltd., which occurred after a protracted illness on December 15th at his home, Milford, Surrey, at the age of seventy years. Mr. Levenger was associated with the G.E.C. for nearly thirty years. In 1909 he was appointed to control the wire department of the company. Apart from the work he performed for his own company, Mr. Levenger did much to stabilise the interests of the whole of the cable and allied industries in this country. In the Cable Makers' Association he represented the joint interests of the G.E.C. and the Pirelli-General Cable Works, Ltd. He was chairman of the Rubber Cable Council in 1936, after having previously served in a similar capacity for four years in the Covered Conductors' Association. His chairmanship of the Association of Steel Conduit Manufacturers (1935-37) did much to consolidate that organisation's aims and endeavours, and he was largely instrumental in the formation of the Association. He leaves a widow and three sons (who are with the G.E.C.). The cremation took place at Golders Green on Saturday, December 17th. Among those present were the following: Mr. and Mrs. M. J. Railing, Dr. A. H. Railing, Mr. and the Hon. Mrs. Leslie Gamage, Mr. J. Y. Fletcher, Mr. F. Winstanley, Mr. T. W. Heather, Mr. and the Hon. Mrs. Trevor Rose, Mr. Hugh Hirst, Mr. Stiles (secretary of the C.M.A.), representatives of various cable companies and of the many departments of the G.E.C.

The late Mr. M. Levenger

Herr C. Krecke.—The death occurred recently in Berlin at the age of fifty-four of Herr Carlo Krecke, the president of the Bewag Co., which controls the electric lighting and power supply of the German capital.

Will.—Sir Philip Dawson, M.P., a director of Johnson & Phillips, Ltd., and a number of electricity supply companies, left £22,848, with net personalty £17,703.

Commercial and Industrial News

The Hire Purchase Act. New E.C.A. Members. Electricity in a Restaurant. Birmingham Produces a Film. Electrical Manufacture in Scotland. New Bacup Showrooms.

Hire-purchase and Electrical Appliances

THE Hire Purchase Act, 1938, which comes into force on January 1st has necessitated an overhaul of all hire-purchase agreements by the electricity supply industry and the Council of the Electrical Development Association felt that it would be very desirable to endeavour to bring about uniformity in this particular matter. Accordingly a draft agreement was submitted to the Incorporated Municipal Electrical Association, the Incorporated Association of Electric Power Companies, the Conference of Joint Electricity Authorities, &c., the Provincial Electric Supply Association, the London Electricity Supply Association, and the Association of Municipal Corporations. A co-ordinating committee, consisting of representatives of these associations, was eventually set up and a meeting was held under the auspices of E.D.A. on December 9th, when a final model form of standard hire-purchase agreement was agreed. Copies of this agreement have now been circulated to the supply associations and A.M.C. for their members.

New E.C.A. Members

At a recent meeting of the E.C.A. Council a number of applications for membership were considered and the following contractors were admitted to full membership:—

Middlesex Electrical Co., Ltd., 62, Oxford Street, W.1; Jewell & Norcombe, Dorchester; F. I. Rice, Bristol, 4; Neon Electrical Contractors, Bristol, 3; A. Brand, Plymouth; J. Elvins, Birmingham; Lemco Electric, Aston; E. Perry, Birmingham, 6; R. V. Baker, Worcester; A. M. Clark & Co., Hull; J. H. Graham & Sons, Ltd., Hull; F. Wood, Alderley Edge; W. E. Kidd, Warrington; I. Drazin, Hampstead, N.W.; Horton Smith & Co., Ltd., 18, Burnt Ash Road, S.E.12; Geo. Fleming, Gravesend.

The following contractors were admitted to associate membership:—

Chas. Owen, Swansea, and T. Anderson, Alderley Edge.

An All-electric Restaurant

Miss E. Robinson, until recently technical assistant in the electrical section of the Building Centre, has embarked on a new venture in opening the "Idle Hour" Restaurant at 7, Hanover Street, London, W.1. As might be expected, every service possible—lighting, cooking, heating, water heating, refrigeration, fans, clocks and kitchen machinery—is electric, and the very latest equipment is employed. The cooking apparatus, which was practically all made by the Jackson Electric Stove Co., Ltd., includes a thermostatically controlled pastry oven and six separate Backer-Jackson hotplates which are believed to be the first of their kind to be installed commercially. Among other kitchen equipment there are a "68J" cooker with three Backer-Jackson hotplates, a griller, two warming cupboards, a "Euk" automatic toaster, four coffee percolators (Jackson Boiler Co. with Metrovick elements), a 2-qt. Hobart mixer, a 1-pt. Horlick's mixer, a 25-cu. ft. B.T.H. refrigerator and a Kelvinator ice-cream machine.

The restaurant itself represents a terrace overlooking the Mediterranean, the whole of the decorative scheme including the lighting fittings (made by S.L.R. Electric, Ltd.) and a series of window motifs were designed by Miss Robinson. Behind the service counter the impression of sunlight coming through shuttered windows is created by the use of four tubular lamps with a total loading of 750 W. Dainty "Evenlite" tubular lamps are fitted on the staircases, and all the cupboards, vaults, &c., have lights, "Cosmos" lamps being employed throughout the building. A Holophane trough unit illuminates the window. The main heating is carried out by means of eight British Trane convectors, controlled by "Satchwell" thermostats and Venner time-switches, supplementary 2-kW Bratt Colbran radiators being provided in the office and staff room. For air circulation there are six Marelli fans—one oscillating wall, one pedestal, and four ceiling models. Water is heated by means of 60-gal. and 3-gal. Heatrae units. Also helping to make up the 70 kW connected load are Instanta clocks, a Hoover "Dustette" cleaner, and a Smith cigarette lighter. Central control of the installation is effected by a single panel constructed of Simplex gear, M.K. sub-switches being used. All services are separately metered. The installation was carried out by the District Electric, Ltd., under the direction of Mr. A. Hunt, to a specification drawn up by Miss Robinson.

Birmingham's Electrical Film

An excellent propaganda film ("Current Affairs") has been produced by the Birmingham Electric Supply Department in collaboration with Publicity Films, Ltd. We had an invitation to a "pre-view" in London last week when Mr. R. H. Rawll and Mr. Anderson of the Department were present to tell us about its production. The film, which has a run of about five minutes, is intended for exhibition at local cinemas; it will be shown in sixty-three and it is calculated that about 603,000 people will see it. Upon this basis it is reckoned that the cost of the film will work out at 0.45d. per head. When the film has gone the round of the cinemas, which will take about two months, it will still be of service in 16 mm. form for the Department's use.

The story commences with "shots" of primitive forms of power—manual, elemental and mechanical—leading up to Birmingham's first power station at Dale End and some splendid views of Hams Hall power station which is now the main source of power. Electricity in the city's life is briefly exemplified, and then in a bright and amusing fashion the audience is shown what a unit of electricity will do in the home. The humorous touches are very good. At one point the commentator mentions that a unit will toast 150 pieces of bread. A weary-looking individual is seen seated at a table piled high with slices of toast which he is counting to prove the truth of the assertion. The comment is excellent, Norman Shelley is the speaker, and is free from the too-clever remarks which are so frequent in film commentaries. The film was made at Birmingham and Merton Park Studios. Many of the sequences could be employed by other undertakings, appropriate "local colour" being added. No mention of prices is made in the film owing to variations in tariffs.

Scottish Economic Committee's Report

The report of the Scottish Economic Committee following an independent investigation carried out by experts of a representative group of light industries in Scotland, was published on December 16th.

The Committee, in an introduction, states regarding the manufacture of electrical appliances and equipment in Scotland that the report brings out very clearly the fact that interests further south have advanced since the war to an extent which makes expansion difficult in Scotland, unless it might be possible for steps to be taken to bring about combination in the industry which would strengthen its productive and competitive capacities. In certain branches, such as the radio industry, a similar position exists as in regard to the motor-car industry. That is, there is already a condition approximating to market saturation in Great Britain, and the chances of expansion in Scotland appear to be limited. Various detailed suggestions are made in the report which are no doubt worthy of consideration by the interests concerned. Taking the position as a whole, however, the question of combination between the different sections of the industry seems to be the main one, and to overshadow other considerations. Whether any such arrangement would be practicable or not is a matter that can only be tested by consultation in the industry and with financial interests.

The all-electric "Idle Hour" Restaurant. Right: Part of the kitchen

The report also deals with the manufacture of heating, ventilating and refrigerating apparatus, of which the Committee says it is gratifying to note that this is a very flourishing industry in Scotland with a wide reputation. Mr. J. M. Hay, B.Sc., A.M.I.Mech.E., lecturer in mechanical engineering at the University College, Dundee, who made an investigation, suggests that there is an extensive field for the production of cast-iron radiators and boilers for modern central heating installations awaiting development by Scottish foundry firms. There certainly seems no reason why a country which has such a fine light castings industry as Scotland should be behind-hand in this sphere, and the Committee hopes that the issue of the report may contribute towards drawing the attention of those concerned to this possible opening for development. Similar considerations apply in the matter of light metal pressings, stampings and spinnings.

Another question of public interest raised in the report is the desirability of air-conditioning plants being installed in modern buildings, both those intended for industry and for other purposes, such as cinemas, hospitals, public buildings, &c. There seems to be here a considerable field for development, and as excellent Scottish firms exist for supplying these requirements, it is hoped that local authorities and others will bear in mind the desirability of utilising this equipment in new constructions. The attention of local authorities is also called to Mr. Hay's interesting suggestion in regard to district heating schemes which, as he points out, have been adopted on a large scale in the United States and on the Continent. Such a scheme is in existence at Dundee, but on a somewhat restricted scale. The Economic Committee thinks that local authorities might well take this suggestion into consideration in any new housing schemes in their districts.

The full report can be obtained from the Scottish Economic Committee, 19, Blythswood Square, Glasgow, price 1s. 6d.

New Showrooms at Bacup

The new showrooms and offices of Bacup Corporation electricity undertaking in St. James's Square, which were opened on December 15th, mark another stage in the progress of the Electricity Department. When started in 1911 the Department was housed in a small room above the rates office in Market Street. In 1927 the Corporation purchased premises in St. James's Street for future development, and it was decided to use them as electricity offices and showrooms. The demand increased to such an extent that five years later extra accommodation became essential. The new showrooms were opened by Mr. A. N. East, engineering inspector of the Electricity Commission, who was welcomed by the Mayor (Councillor W. Hartley) and presented with the key by the architect, who also gave him a fountain pen and pencil from the contractors. The Mayor said that this was the Council's first attempt to erect a building for one of its departments. The scheme had been criticised, but he believed it would justify itself financially. Ald. J. Ireland, chairman of the Electricity Committee, spoke of local industrial development, and said that the electrical engineer (Mr. W. H. Metcalfe) had put his life into the development and deserved congratulations. Mr. East said that the town had a new showroom, a relatively cheap supply, and a good engineer.

New Switchgear Offices at Chester

On December 8th the new administrative office block at the Northgate Works, Chester, of Brookhirst Switchgear, Ltd., was opened by Mrs. Hirst, wife of Mr. J. A. Hirst, chairman of the company, who accompanied her. The opening of the

A group at the opening of the new block of administrative offices of Brookhirst Switchgear, Ltd.

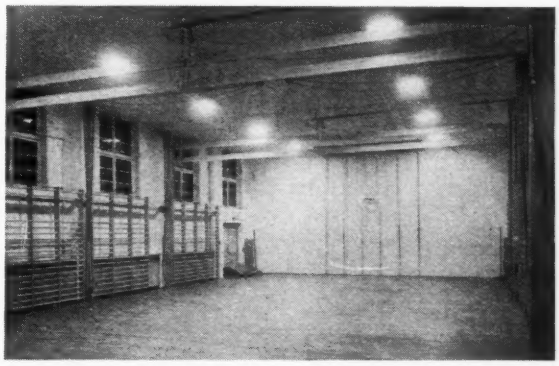
new offices marks the completion of a programme of extensions which has been in progress during the last two years, and which has been necessitated by the continued expansion of the company's business. The premises now occupied represent in floor space over one hundred times that of the original works which were established in Victoria Road about forty years ago.

Engineering Company's Gift to Employés

On the closing of their works at Yeovil the directors of Petters, Ltd., have advised their employés that as a mark of appreciation of the valued and loyal services which they have received they have arranged to make this Christmas a present to all employés of twenty years' service as at December 31st of £5 with an additional £1 for each year of service in excess of twenty years. Every employé concerned who was in the service of the company at September 1st will receive this gift. The arrangement will involve an expenditure of more than £2,000 by the company.

Gymnasium Lighting

An interesting gymnasium lighting installation has recently been completed at the Handsworth Technical School, Birmingham. The installation has been carried out with a special type of "Realaylite" recessed ceiling unit which Rowlands Electrical Accessories, Ltd., developed in conjunction with the City of Birmingham Education Department, and this fitting is now being standardised as the approved unit for gymnasia



The lighting of the gymnasium at Handsworth Technical School

lighting. In this installation the floor area of the gymnasium is 2,520 sq. ft., and twelve fittings have been provided. Equipped with 300-W lamps, *i.e.*, an allowance of 1.43 W per sq. ft., the average intensity at floor level after due allowance for depreciation is 8 ft.-candles. The bottoms of the fittings are totally enclosed with acid obscured armour plate glass. The installation was carried out by H. Pratt, Ltd., of Aston, Birmingham, under the direction of the city authorities.

New Zealand and the Ottawa Agreement

Mr. P. F. Bennett, president of the Federation of British Industries, has sent a letter to the President of the Board of Trade in which he states that the Federation is gravely apprehensive about the results of the policy of the New Zealand Government upon future New Zealand-United Kingdom trade. The Federation points out that cases have arisen which show that the New Zealand Government's policy is to give preference to local manufacturers, even to the possible exclusion of United Kingdom manufacturers of similar articles. The Federation cannot disguise from itself that secondary industries already set up or projected in New Zealand may damage particularly trade previously carried on with the United Kingdom. Moreover, if the administration of the new system is going to result in discrimination between different classes of articles hitherto imported into New Zealand the position then created would amount to a breach of the Ottawa Agreement. In that event, the Federation would have no option but to press the United Kingdom Government to abrogate the Ottawa Agreement at present in existence and to negotiate a new one.

Liverpool Livestock Show

In the Liverpool Livestock Show held at Stanley Meat Market on December 14th, Liverpool Corporation Electricity Supply Department figured prominently in the trade section, with an exhibit of electric cookers, refrigerators and wash boilers suitable for farm and shop purposes. Prominence was given to a miniature shop equipped with modern plant.

Electric Water-heating Contracts

Bastian & Allen, Ltd., have received orders for the electrode boiler for heating the new swimming pool and building at Buckingham Palace, and for the necessary steam boiler and air heaters required for the Turkish and Russian baths. The boiler for the pool is rated at 250 kW and the steam boiler at 10 kW. Other orders recently received by the company include two 50-kW steam boilers for a store at Welwyn; a 20-kW steam boiler for a hospital in Selangor, F.M.S.; a 60-kW circulator for the Grampian Electric Power Co.; a similar equipment for the Fife Electric Power Co.; and four 20-kW steam boilers for various farms.

Municipal Trading at Liverpool

A protest was made at a recent meeting of the Liverpool Ironmongers' Association against the sale from the Liverpool Corporation electricity showrooms in Whitechapel, of 25-, 40- and 60-W lamps at 9d. each, 75-W lamps at 1s., and 100-W lamps at 1s. 3d. The member who made the complaint said this publicity by means of window displays of cheap lamps was detrimental to other sellers who did not concentrate on low-priced manufactures. Mr. W. P. Taylor said that while this activity on the part of the Corporation was regrettable,

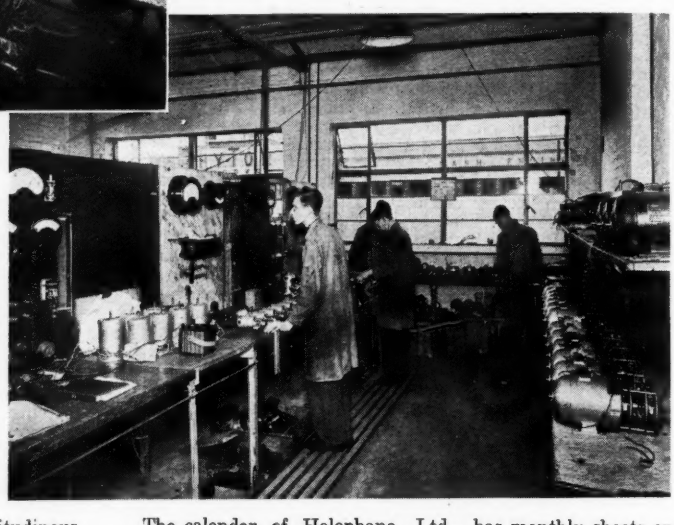
he failed to see what practical steps could be taken to stop it. An official protest would most likely be ineffective. The Association might as well object to the sale of kettles and other appliances. No resolution was adopted.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making industry announces that the "cost of living" figure on December 1st (56 per cent. above the 1914 level) will not involve any alteration in employés wages on the third pay-day in January.

Making Special Motors

New uses for electric drive are daily increasing the demand for special types of electric motors, and the Croydon Engineering Co., Ltd., which confines its attention almost entirely to



A general view of Croydon Engineering Co.'s factory with (right) a portion of the testing laboratories

producing such units, is already having to extend its new factory in Commerce Way, Croydon, into which it moved only two years ago. The drawing office has recently been enlarged and five outbuildings have been erected, the whole factory now covering 13,000 sq. ft. and giving work to about 250 employés. As the site on which the factory stands is about 31,000 sq. ft. there is still plenty of room for further expansion. All the motors are manufactured to specifications, and generally range from $\frac{1}{100}$ to 1½ HP, but units as small as $\frac{1}{1000}$ HP have sometimes been supplied. Every type—DC, single- and three-phase AC, synchronous, capacitor, &c. is produced, and a speciality is made of geared and governed types and models with extra-lightweight frames giving a high power/weight ratio. Although the uses for which the motors are required are multitudinous, large numbers are sold for telephone and telegraph work, laboratory drives, cinematograph cameras and projectors, drilling machines, mixers, chemical work, high-speed blowers, &c.

Among the many other interesting items we saw in process of manufacture when we called a few days ago were geared units for small service lifts, 12,000-RPM motors for television work, a motor-generator set for a mobile sound-recording outfit, having controlled frequency over a wide voltage range, rotary convertors for police car radio sets, power drives for totalisators, and units with hollow spindles enabling the shafts to be extended to any desired length. All the winding of the armatures and field coils is carried out by hand, and tropical impregnation has been almost universally adopted. Each coil of the armatures is separately troughed in successive coverings of mica, paper and mica, non-linseed components being employed throughout. The outside coverings are of leatheroid, and all the small armatures are wound with double silk-covered wire. The field coils are taped with mica, and special precautions are taken to ensure air-gap concentricity. All the rotating components are dynamically balanced. A special feature is made of testing, and a record is kept of the characteristics and performance of every machine before it leaves the works. In the research laboratory a silence cabinet has been provided to measure noise and so assist in securing quiet running of the motors.

Change of Address

The address of the International Tin Research and Development Council from December 25th will be Fraser Road, Greenford, Middlesex (telephone: Perivale 4254).

Calendars and Diaries

The wall calendar received from C. A. Parsons & Co., Ltd., has monthly sheets each showing the calendar for the current, preceding and following months. The Heaton Works were founded in 1889, and each sheet of the calendar bears an illustration comparing some of the company's early products with its present-day modern plant.

British Brown-Boveri, Ltd., has again sent us a calendar with some excellent reproductions of photographs of the Swiss Alps.

The monthly sheets of the calendar received from Crofts (Engineers), Ltd., bear illustrations of some of the company's products.

"Safely Home," a sea picture by Sam J. M. Brown of a brig returning to port, makes a colourful calendar received from F. W. Brackett & Co., Ltd.

The monthly sheets of the calendar of Ruston & Hornsby, Ltd., bear illustrations of some installations employing the company's oil engines.

Landis & Gyr, Ltd., have sent us a refill for their desk calendar.

Messrs. Robey's calendar has monthly sheets drawing attention to their Diesel and steam engines and other products.

We have again received from the Lytham St. Annes Corporation two artistic calendars which are facsimile oil paintings. One, entitled "Highland Laddie," by Robert Morley, shows an appealing Scottish cairn, while the other, "Invergarry Castle," by A. de Breanski, is a charming view of the castle at sunset.

The Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd., have sent us a refill for their engagement pad and a "Geographia" road atlas of England and Wales with Southern Scotland, bound in a stiff black cover.

Price & Belsham, Ltd., and P. & B. Engineering Co., Ltd., have sent us a useful paper knife in green, the handle of which has a reading glass.

The calendar of Holophane, Ltd., has monthly sheets on which are reproduced photographs of a number of varied lighting installations designed by the company.

"We're Awa'!" is an attractive picture of a Scottish laddie and his dog which adorns the calendar received from G. E. Wallis & Sons, Ltd.

E.I.B.A. Christmas Boxes

Christmas boxes were despatched in good time by the E.I.B.A. to all its beneficiaries. Each received a gift of money, equivalent to an extra week's allowance, together with chocolates or cigarettes according to the preferences of the recipients. Accompanying the gift was a Christmas card from the chairman of the Court, Mr. J. N. Stephens, and the E.I.B.A. thanks the anonymous donor of the chocolates and cigarettes, and the many people throughout the country, who by making Christmas collections, have enabled it to provide the money gifts.

Trade Announcements

From December 20th the Ipswich branch of Johnson & Phillips, Ltd., will be at 5, Arcade Street, Ipswich. The telephone number and telegraphic address remain unchanged. Extensive stores form part of the new premises and larger stocks will be available for immediate delivery.

Sparton Electrical Commodities, Ltd., are about to market the "Sparton" dry shaver for use on 200/250 V supplies.

Faraday's Researches

Venner Time Switches, Ltd., have sent us a volume from "Everyman's Library" entitled "Experimental Researches in Electricity" by Michael Faraday, with a foreword by Prof. Tyndall. Venner's have added a neat dust cover in dark blue and the present volume is marked "Venner's Library, No. 1."

The Contractors' Conference

We have already reported that next year's annual conference of the Electrical Contractors' Association and its allied organi-

sations is to be held at Brighton. It is now announced that the period of the conference will be June 28th to 30th inclusive.

New Year Holidays

The works of Bruce Peebles & Co., Ltd., Edinburgh, will close on December 30th and re-open on January 5th. The head office will be closed on December 26th.

Timely Assistance

A 2½-kW emergency Diesel plant lent by Messrs. R. A. Lister & Co., Ltd., enabled the Royal Hospital at Richmond to carry on during the "black-out" resulting from the fire at the Kingston generating station last week, referred to on page 894. The plant, which was sent by car to the hospital the morning after the fire, was installed in the courtyard and connected up with the existing wiring system. It provided light to the operating theatre, and made available an emergency service at key points throughout the hospital.

For Sale

Bedford Electricity Department has frequency changers for disposal.

(See our classified advertisements.)

A Rope Works Lighting Installation

A new lighting installation has recently been provided at the works of the Gourock Ropework Co., Ltd., Port Glasgow. Over 700 Benjamin "Saaflux" reflectors have been installed, giving good diffused lighting and reducing the shadows to a negligible amount. The accompanying illustration shows the

Benjamin reflectors are used for lighting the works of the Gourock Ropework Co., Ltd.

Yankee section which deals with process manilla preparing and spinning for rope yarn. In this section forty-two 200-W "Saaflux" concentrating reflectors and eighty-six 100-W "Saaflux R.L.M." reflectors are installed. The installation was designed by the Benjamin Electric, Ltd., and was carried out by Osborne & Hunter, Ltd., of Glasgow.

New Catalogues and Lists

Aerex Fans, 36, Rutland Park, Sheffield, 10.—A catalogue of "Aerex" industrial ventilation equipment.

The Broadway Ladder, Truck & Caster Co., 868, Manchester Road, Bradford.—Lists of semi-pneumatic rubber mats and lifting or jack trucks.

McGregor & McCallum, Ltd., 1, Newman Street, London, W.1.—A leaflet describing the "Filordrain" attachment for filling and emptying washboilers, washing machines, &c.

E. K. Cole, Ltd., Ekco Works, Southend-on-Sea.—Details of hire-purchase terms for Ekco-Coffield washers.

S. Wolf & Co., Ltd., Pioneer Works, Hanger Lane, Ealing, W.5.—Leaflets describing a number of new tools, including tool post grinder, valve refacer, valve seat grinder and sander.

Goodliffe Electric Co., Ltd., Goodtric Works, Purley Way, Croydon.—Leaflets giving details of the "Purley" floor polisher and "Mark Time" switches.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A booklet dealing with industrial heating and ventilation.

Newalls Insulation Co., Washington Station, Co. Durham.—An illustrated art booklet describing a system of fire protection for steelwork construction and electric cables.

British Insulated Cables, Ltd., Prescot.—Leaflet P.F.321, describing a mining type coupling box.

Barber Switchgear Co., Sutton Street, Birmingham, 1.—A catalogue of switch, fuse and control gear.

Jicwood, Ltd., Weybridge.—Details of "Jicwood," a new compressed and impregnated material.

Bankruptcy Proceedings

C. Clewer, carrying on business as "C. & F. Radio Service," 1006, Coventry Road, Hay Mills, Birmingham, wireless dealer.—The first meeting of the creditors was held at the Official Receiver's Office, Somerset House, 37, Temple Street, Birmingham, on December 1st and according to the statement of affairs returned there were ranking liabilities of £397 and estimated assets of £187, leaving a deficiency of £210. Debtor stated that his failure was due to his becoming liable to finance companies for balances owing by defaulting customers. The case was left in the hands of the Official Receiver as trustee.

F. Adams, lately trading with another as Adams & Barlow, 11, Station Parade, Wanstead, electricians.—This debtor's application for discharge was heard before Mr. Deputy Registrar Mellor at the London Bankruptcy Court on November 30th. The Official Receiver reported that the receiving order was made in September, 1934, the joint liabilities amounting to £1,509, while the assets had realised £96 and a dividend of 2¾d. in the £ had been paid. The discharge was suspended for six months.

J. T. Wyer (East Coast Electrical Services), electrician and radio dealer, 34, Hilderthorpe Road, Bridlington.—Public examination January 17th at the Court House, Scarborough.

W. J. M. Edwards (Radio Exchange Co.), radio dealer, 54, Cowbridge Road, Cardiff.—Trustee, Mr. L. S. Findlay, 35, Windsor Place, Cardiff, appointed December 9th.

A. E. Barrow, wireless and electrical dealer, 95, Swaine House Road, Five Lane Ends, Bradford, formerly carrying on business at 217, Huddersfield Road, Low Moor, Bradford.—Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford, Official Receiver, released November 25th.

T. N. G. Gelsthorpe (deceased), electrical merchant's manager, late 46, Devonshire Drive, Scarborough.—Trustee, Mr. J. S. Snowball, Bank Chambers, Scarborough, Official Receiver, released November 30th.

R. R. French (Radio Electrical Services), radio dealer, Chandos Place, St. Austell.—Trustee, Mr. G. C. Hancock, 12, Princes Street, Truro, Official Receiver, released November 30th.

E. W. Pearson, electrician, 59, Bedford Road, Southport.—First and final dividend of 5½d. in the £, payable December ment Buildings, Victoria Street, Liverpool.

J. H. Thompson (C. M. Hawkins & Son), electrical contractor, 186, Lodge Lane, Liverpool.—First and final dividend of 4¾d. in the £, payable at Government Buildings, Victoria Street, Liverpool.

C. H. Chadwick, radio dealer, Mill Road, Cromer.—First and final dividend of 3s. 8d. in the £, payable December 14th at Castle Chambers, Opie Street, Norwich.

W. B. Smithers, electrical contractor, 11, Lunt Grove Avenue, Birmingham, lately trading at 11, Oakwood Close, Dartford.—First and final dividend of 5½d. in the £, payable December 20th at 280a, High Street, Rochester.

R. T. Collins, radio dealer, 41, Market Street, Penryn, Cornwall.—Supplemental dividend of 2s. 4d. in the £, payable at 12, Princes Street, Truro.

F. H. Bennett, radio dealer, 52, Oakfield Road, Ilford.—Trustee, Mr. H. C. Treby, 7, Warwick Court, Gray's Inn, London, W.C.1, appointed December 13th.

O. Wales, electrical engineer, 82, Rusper Road, Horsham.—Last day for receiving proofs for dividend December 30th. Trustee, Mr. V. R. Fletcher, 3, Old Steine, Brighton, Official Receiver.

W. F. Buttery, electrical contractor, 34, Holme Lane, Dudley Hill, Bradford, formerly trading at 293, Tong Street, Dudley Hill, Bradford.—First and final dividend of 2s. 5d. in the £, payable at 71, Manningham Lane, Bradford.

Company Liquidations

Hunts Wholesale Supply Co., Ltd., electrical dealers, &c., Newark-on-Trent.—The statutory meeting of the creditors was held recently at the Ossington Hotel, Newark, when a statement of affairs was submitted showing liabilities of £1,323 and net assets of £591, leaving a deficiency, as regarded the creditors, of £732. The issued capital of the company was £200, and so far as the shareholders were concerned there was a deficiency of £932. The creditors decided that the voluntary liquidation of the company should be continued, with Mr. W. L. Dunn, of Chamberlain & Merchant, Nottingham, and Mr. F. E. Bendall, of Poppleton & Appleby, Birmingham, as joint liquidators. A committee was also appointed.

British Permel Enamelled Wire, Ltd.—Winding up voluntarily. Liquidator, Mr. A. B. Adam, Victoria Works, Charlton, S.E.7.

Dissolution of Partnership

T. W. Dennison & Co., electrical and radio engineers, 40, Thornton Road, Bradford.—Messrs. H. Boyes and T. W. Dennison have dissolved partnership. Mr. Dennison will attend to debts and carry on the business.

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 14th:—

Dexrae. No. 600129. Class 10 (IV). X-ray apparatus for all purposes.—Adam Hilger, Ltd., 98, St. Pancras Way, Camden Road, N.W.1.

Deloray. No. 600883. Class 11 (IV). Electric light reflectors.—B. Berger & Co., Ltd., 176, Albion Road, Stoke Newington, N.16.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

CLEARSITE fuse.

SARJA pump for aerating tank.

Electricity Supply

Lighting, Domestic, Power

Barnstaple.—SCHOOL HEATING.—Negotiations are being conducted for heating the new senior girls' school at Ladies' Mile by electricity.

Bexhill.—MAINS.—The Electricity Committee is to extend the mains at a cost of £251 to supply further houses on the Heights estate.

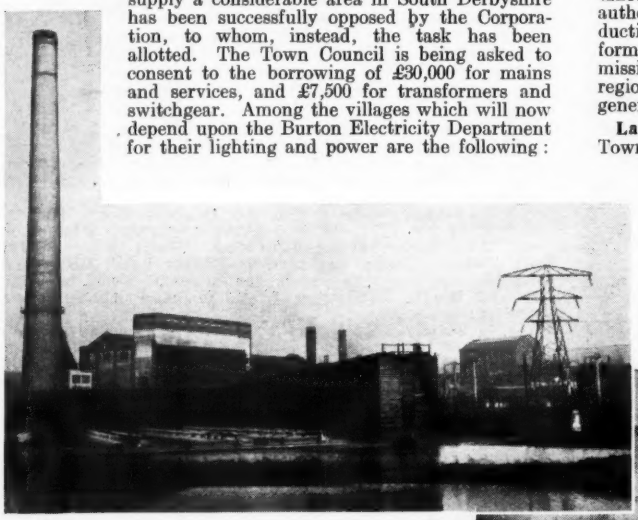
Blackburn.—X-RAY EQUIPMENT.—A gift of £1,000 has been made to the Blackburn Royal Infirmary towards the cost of modernising the X-ray department.

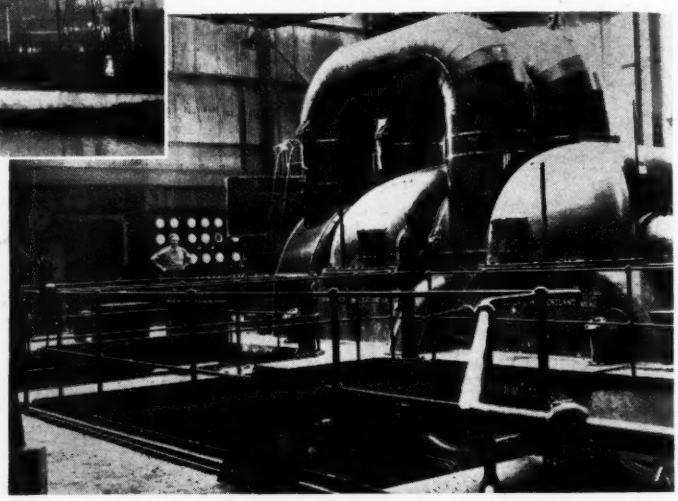
Brandon.—ELECTRICITY TO REPLACE GAS.—The Council has accepted an offer of the East Anglian Electric Supply Co. for street lighting over a seven-year period, provided a slight extension of the lighting area is agreed to. At present the streets are lighted by gas.

Burton-on-Trent.—LOANS.—Application is being made for permission to borrow £30,000 for mains and services and £7,500 for transformers and switchgear. The Committee is also to extend the switchroom at the power station.

PROPOSED EXTENSION TO YOXALL.—The Electricity Committee is seeking power to supply electricity to premises at Woodhouses, Yoxall.

SUPPLY IN SOUTH DERBYSHIRE.—An application by the Derbyshire and Nottinghamshire Electric Power Company to supply a considerable area in South Derbyshire has been successfully opposed by the Corporation, to whom, instead, the task has been allotted. The Town Council is being asked to consent to the borrowing of £30,000 for mains and services, and £7,500 for transformers and switchgear. Among the villages which will now depend upon the Burton Electricity Department for their lighting and power are the following: Ticknall, Ingelby, Calke, Smisby, Derby Hills and Stanton-by-Bridge.





Extensions just being completed at the Hartshead generating station of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board include the erection of a 340-ft. chimney and the installation of a 31,250-kW "Metrovick" generator, together with three Babcock & Wilcox boilers and auxiliaries. Right: The generator being tuned up

Chester.—EXTENSIONS.—The electrical engineer has submitted a further report upon the proposed extension of the Queensferry power station and an amended scheme which has been prepared in consultation with a power station specialist. Sanction is to be sought by the Electricity Committee to a loan of £397,280 for the extension.

Croydon.—YEAR'S WORKING.—Despite a drop of five million kWh in the amount of electricity sold for traction during 1937-38, Mr. F. N. Rendell-Baker, the borough electrical engineer, reports a net increase of six million kWh, bringing the total sold to 118,957,500, for which the average price received was 1.086d., as compared with 1.089d. in 1936-37. An increase of 2,441 in the number of consumers brings the total to 56,845, of which rental wiring consumers number 10,948. Expansion of the distribution system during the year has included 39 miles of cable and four sub-stations. Three miles was added to the length of main roads lighted by mercury lamps, and three miles of sodium lighting was also brought into operation during the year.

To cope with the demand for cooking demonstrations two lectures a week are given in the showroom, and the number of cookers on hire increased from 6,582 to 7,680. The total number of water heaters and immersion heaters connected at March 31st last was 5,600, of which about one-fifth were added during the past year. The new 30,000-kW set and high-pressure boiler commenced operation in January, 1938, and between then and the end of March the coal consumption per kWh dropped from 1.46 lb. to 1.35 lb., and even better figures are expected. Fourteen thousand meters were tested, and 19 per cent. of the old meters and 11 per cent. of the new ones were rejected. In connection with A.R.P., arrangements have been made both to obtain and provide duplicate supplies.

ELECTRICAL THERMAL STORAGE INSTALLATION.—At a recent meeting of the Electricity Committee approval was given to a supply of electricity being provided for a thermal storage installation to be carried out at the premises of Rollason Aircraft Services, Ltd.

DOMESTIC SUPPLIES.—Mains are to be extended at a cost of £1,063 to supply houses in the Whitehorse Road area. The Electricity Committee is also to erect sub-stations in the Northcote Road and Whitehorse Road areas at an estimated cost of £2,111.

Hastings.—ELECTRICAL DEVELOPMENT TO AID EMPLOYMENT.—The Electricity Committee proposes to carry out mains extension work in advance of schedule to provide work for unemployed at a cost of £15,789.

Inverness.—NO EMERGENCY PLANT.—At a meeting of the Chamber of Commerce last week Mr. G. C. M'Lean, the burgh electrical engineer and manager, stated that owing to the dispute between the Council and the Electricity Commissioners the town had no plant for emergency use. If one of the turbo-alternators broke down it would be necessary to restrict the supply. He also criticised the Central Electricity Board for concentrating on the production of electricity in a few selected stations. Although efficiencies might be improved, it was at the expense of reliability of supply. That Inverness should be furnished with electricity by transmission lines coming over the snowclad and windswept mountains between Tummel and Inverness was a hazard which Inverness could not afford to take. He added that it was well known that the military authorities were strongly averse to the concentration of production of power in a few generating stations which would form an easy target for hostile aircraft, while overhead transmission lines were susceptible to damage by sabotage. Every region in the country should, therefore, possess sufficient generating plant for local requirements.

Laurencekirk (Kincardineshire).—STREET LIGHTING.—The Town Council is to hold a special meeting to consider whether electricity shall be adopted for street lighting in the burgh. It has received several offers for the installation of electric lighting, and the total cost will be approximately £225.

London.—FULHAM.—The borough electrical engineer has negotiated with Higgs & Hill, Ltd., for the demolition, excavation and foundation work required for the proposed extension of the power station and a tender of £101,136 has been quoted. The acceptance of this has been authorised by the Electricity Committee, subject to the necessary approval.

Manchester.—SITE FOR NEW POWER STATION.—An advance was made on Monday in the latest £2,000,000 development scheme of Manchester Corporation Electricity Department. Details were submitted to the Rivers Committee, owners of the 22 acres of land on which it is proposed to build a new power station, and the Committee consented to the transfer of the land. It is situated a few miles out of the city centre, on the Ship Canal bank just below Irlam Lock, near to the Mersey Weir.

Newcastle-on-Tyne.—LARGE SCHEME FOR HOUSE INSTALLATIONS.—The City Housing Committee has prepared a plan for the wiring of 4,891 houses which at present use gas. Together with the purchasing of hired wiring in another 1,068 houses the cost will be £42,127.

Northern Ireland.—FARM SUPPLIES.—In the N.I. House of Commons last week the Minister of Commerce was asked whether he would make representations to the Electricity Board for Northern Ireland to formulate a scheme whereby farmers would be enabled to procure supplies of electricity at a reasonable rate and without being called on to put down a substantial sum on installation. Colonel Gordon said that the

supply of electricity to farmers in Northern Ireland was a matter which was at present receiving the attention of an inter-departmental committee under the chairmanship of the Financial Secretary to the Ministry of Finance.

Preston.—ELECTRICITY FOR SCHOOL.—The Education Committee proposes to have electricity installed at Eldon School, at an estimated cost of £1,029.

Rothwell.—SUB-STATION.—The Yorkshire Electric Power Co. is to erect a sub-station at Rothwell Haigh.

Silksworth (Co. Durham).—STREET LIGHTING.—Local electors have approved a plan to improve the street lighting system at a cost of £219.

A large group of people watched Alderman C. A. Critchley, chairman of the Blackburn Electricity Committee, switch on the Christmas illuminations on December 16th. On his left is Mr. R. H. Harral, borough electrical engineer and manager, and on his right Councillor E. Porter, vice-chairman of the Electricity Committee, and Mr. G. H. Sammons, chief electrical assistant

Southport.—SUPPLY TO ENGINEERING WORKS.—A supply from the Corporation's mains was recently switched on at the works of the Brockhouse Engineering Co., Ltd., where hitherto private generation has been employed. The initial load is 600 kVA, which is expected to rise to 1,000 kVA as the works are extended.

Taunton.—APPARATUS FOR DEMONSTRATION.—The Town Council has authorised the borough electrical engineer to purchase consumers' apparatus and electrical equipment for demonstration purposes at the new electricity showrooms, at a cost not exceeding £500.

Todmorden.—METERS.—The Town Council is seeking sanction to a loan of £3,000 for meters.

Uxbridge.—INQUIRY CONCLUDED.—The inquiry by the Electricity Commissioners into the proposed transfer of the purchase powers of a number of local authorities to the London and Home Counties J.E.A. was closed on Friday last. During the further proceedings Major H. Richardson, a member of the J.E.A. who is director and general manager of the Metropolitan Electric Supply Co., criticised the Authority. Those who were in his position on the Authority were in a total minority, he said, and it was a perfect farce that they were supposed to represent anything.

Wolverhampton.—SUPPLY TO ESTATES.—The Electricity Committee is to extend the mains to estates at Albrighton (£690), Oxley (£180), Nine Elms (£180), Trysall Road (£324), Aldersley (£141), Merridale (£371), Pendleford Avenue (£632) and Shifnal (£262).

Overseas

Australia.—POWER SCHEME INVESTIGATIONS.—The Royal Commission appointed to inquire into the establishment of a national power scheme at Collie (W.A.) has been seeking and collating information and investigating various technical aspects of the problem. Questionnaires have been sent to all local authorities within a radius of 70 miles, and the Departments of Agriculture and Water Supply have also been approached. Members of the Commission are Messrs. F. E. Shaw (mechanical engineer of the Public Works Department), W. H. Taylor (general manager of the Government Tramways and Electricity Supply) and F. C. Edmondson (general manager of the Perth City Council Electricity and Gas Department).

POWER STATION INTERCONNECTION.—The New South Wales Government is considering a proposal for the linking up of the main power stations at Bunnerong (Sydney), Lithgow, Newcastle, Nymboida (in the north), Port Kembla and Goulburn. The Nymboida system will be linked with the southern Queensland system, while in Victoria the Yallourn system will be linked with the new power station at Kiewa, near Mount Buffalo, and will then extend into New South Wales. Probably South Australia will later on be linked with the other three States.

Finland.—NEW WATER-POWER PLANT.—The large Finnish industrial combine, Enso-Gutzeit Osakeyhtio, has ordered the erection of a 100,000-kW water-power station at Enso-Vallinkoski, on the River Vuoksen. The turbines will be supplied by a Finnish firm, while the generators have been ordered from the Metropolitan-Vickers Electrical Co., Ltd. This is the first time that such a big Finnish order for electrical machinery has been placed in Britain. The Enso-Vallinkoski scheme is the most important of its kind in Finland.

India.—DARJEELING HYDRO-ELECTRIC PROJECTS.—According to *Indian Engineering*, an inspection of sites for hydro-electric projects in the Lodhoma, Sirikhola and Raman valleys is to be carried out by Mr. H. S. Suhrawardy, Minister for Commerce and Labour, Bengal. It is hoped that a source of power will be found suitable for a scheme to feed northern Bengal, or alternatively, Darjeeling and adjacent districts.

Norway.—LARGE DISTRIBUTION SCHEME.—The equivalent of £100,000 is being spent by the Nordhordland Kommunale Kraftlag on extension of its network of transmission lines so as to ensure complete electrification of eleven districts in the county of Nordhordland.

Russia.—THE NESVETAI POWER STATION.—The *Monthly Review* of the U.S.S.R. Trade Delegation in the United Kingdom reports that considerable constructional activity is in progress several miles to the east of the town of Krasny Sulin, on the right bank of the River Kundriuchei, where one of the large new works of the third five-year plan—the Nesvetai power station, partly hydro-electric and partly thermal—is being constructed, and where the finishing touches are being put to the dam, weirs and two great locks which will make the weirs negotiable for transport. The station is being erected close to the coal mines of the Nesvetai and Shachtinsky areas and the steam portion of the plant will be operated by a soft low-grade anthracite of which 6,000 tons will be consumed daily. When the third section of the constructional work is completed the power output of the station will be equal to that of the Dniepr plant. High-voltage transmission lines will run to all the industrial centres of the region, including Taganrog, Krasny Sulin, Rostov, Novocherkassk, Shachtinsky and Nesvetai. It is expected that the first 50,000-kW turbo-generator will be brought into operation by the end of 1939.

Sweden.—ELECTRIFICATION OF RURAL AREAS.—A special committee appointed by the Government two years ago to inquire into the present state of electrification and to suggest a scheme pertaining to rural electrification in particular, has recently published its report. It has been found that roughly 80 per cent. of Swedish inhabitants are being supplied with electricity. The cost of extending the supply to the better part of the remaining fifth of the population, excluding areas where electrification is considered impossible for economic and technical reasons, is estimated at approximately £3,250,000.

Traction

Italy.—RAILWAY ELECTRIFICATION.—With the approaching completion of work on the Trans-Apennine section from Orte to Ancona the length of electrified railway lines will reach 3,155 miles, most of which will be double track. For carrying goods for export the State Railways have ordered a large number of refrigerator wagons. It is reported that the second series of E428 type locomotives recently put into service are giving excellent results. These locomotives have eight motors, weigh 128 tons, and develop a speed of 94 m.p.h.

A general view of the new station of the London Passenger Transport Board at Uxbridge, serving the Metropolitan and Piccadilly lines, which has been erected in the centre of the town, a quarter of a mile from the old station in the outskirts

Sweden.—LARGEST PRIVATE RAILWAY BEING ELECTRIFIED.—Sweden's largest private railway concern is at present electrifying two of its most important lines, namely, Göteborg-Mellerud-Amal and Mellerud to the Norwegian frontier, altogether about 140 miles. It is anticipated that the first line will be ready by about May, 1939. By 1941, when the elec-

trification of the Norwegian railways between the Swedish frontier and the Norwegian capital, Oslo, is expected to be ready, the entire route from Malmö to Göteborg and Oslo will have electric traction. In connection with these works the railway company has placed orders for electric locomotives, &c., valued at about £412,400. The first locomotive of a series of nine which has just been delivered, is an express engine of 2,000 HP with a maximum speed of 68 m.p.h.

Communications

Denmark.—POLICE BROADCASTING INTRODUCED.—A substantial subsidy afforded jointly by the Government and the Copenhagen municipality has enabled the metropolitan police force to order a central police transmitter and radio telephone equipment for a number of police motor-cars.

Great Britain.—COLD AFFECTS RADIO TRANSMISSION.—Through the frost causing valve water-coolers to burst the London Regional programme was not started until 2 p.m. instead of 10.30 a.m. on Sunday, and then at reduced power. The London National transmitter was also affected, but was able to begin according to schedule at 4 o'clock.

L.N.E. Railway.—AUTOMATIC TELEPHONY AT EDINBURGH.—A new automatic telephone system was brought into operation at Waverley Station, Edinburgh, on December 12th. The equipment was supplied and installed by Ericsson Telephones, Ltd.

Norway.—NEW SHORT-WAVE TRANSMITTER.—Oslo Kortbolgekringkaster, a new 5-kW short-wave broadcasting station, was inaugurated recently. It is designed for operation on three frequencies, *viz.*, 9,350, 11,735, and 15,170 kc/s., while the present 1-kW short-wave broadcaster at Jeloy is to have its frequency changed to 6,130 kc/s.

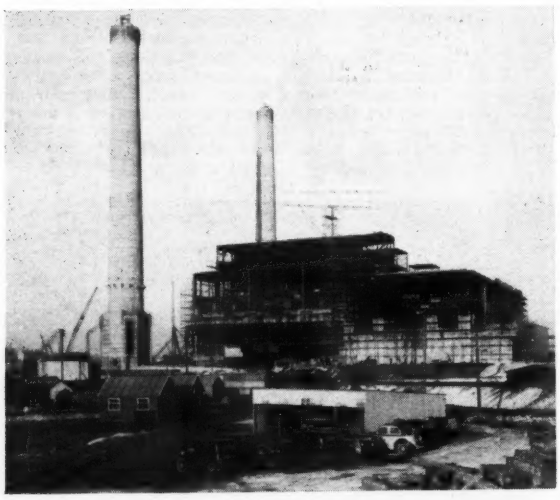
Sweden.—GROWTH OF TELEPHONY.—Progress in the telephone field was reviewed in the course of a lecture given before the Institute of Swedish Engineers by the P.M.G. He said that work during more recent years had above all been concerned with the quickest possible conversion of urban exchanges to automatic operation, and that similar facilities were now to be extended to rural subscribers. The present number of telephone installations in Sweden was nearly three quarters of a million, or approximately one per eight inhabitants. There were more than 6,400 exchanges and they handled over 1,000 million calls last year. The equivalent of more than £25 million was invested in the Swedish telegraph and telephone system and aggregate earnings last year were £6,750,000, against operating expenses totalling £5,000,000. New equipment was being acquired at the rate of nearly £1¼ million a year. Telephone equipment worth about £5,000,000 had been supplied during the past decade by the Administration's own works at Nynashamn, while the private company Telefonaktiebolaget L. M. Ericsson had during the same period supplied £7,000,000 worth of telephone material to the P.O.

The Postmaster-General concluded his lecture by stating that a large scheme was under way in south-west Sweden where it was proposed to make some 90 exchanges automatic, and all subscribers within an area of 1,500 sq. miles would thus be within dial-telephone reach of each other.

New Dartford Power Station

Rapid progress being made

BY the kind permission of Mr. W. J. H. Wood, engineer-in-chief to the County of London Electric Supply Co., Ltd., we were able recently to see what progress has been made in the construction of the new Littlebrook Power Station of the Kent Electric Power Co., Ltd. We must admit surprise to see such great advance in spite of the fact that the building is of all-concrete construction. We were told that work actually on the site began in the summer of 1937 and a commencement on the plant foundations was made towards the end of that year. Perhaps the most surprising thing in these days of late deliveries is the fact that there have been no serious hold-ups of material. The only brickwork in the building is the partition wall between the turbine and boiler houses. The main structure of the building is practically complete, including the coal bunkers over the boiler house,



Present construction stage of the Littlebrook power station

although here and there a little roof shuttering is still required. The 120-, 20- and 12-ton cranes spanning the main building are, of course, already doing good work.

The initial generating plant will consist of a B.T.H. 60,000-kW turbo alternator with Vickers condensing plant and two 30,000-kW Parsons turbo-alternators with Hick Hargreaves condensing plant. Construction of the circulating water pump house has now reached a stage above ground level. Sheet piling 60 ft. high was driven into the ground to form the necessary basin from which the soil was removed by grab cranes before the concrete bed and walls were constructed. There will be four circulating pumps, each with its own chamber and each pair in its own watertight chamber. Two tunnels are to connect the pump house with the two caissons in the river, and one caisson is nearly finished. Ducts from the pump house to the turbines are in the early concreting stages. They are being built round wood formers with steel cage-work reinforcement. Three circulating water outlets have been completed up to the riverside works and the ground caisson is already in place.

One of the small sets will be the first to be completed and we were told that it is hoped to have steam on this set for trials next June. The heavy parts of the machine are on the site but not in position, although the beds for both small sets have been completed. The bed for the 60,000-kW set is now waiting for concrete pouring. We also saw the stator frame of the large set waiting ready for winding on site. Both pulverised-fuel-fired boilers and stoker-fired boilers are being installed, the first by the International Combustion Co., Ltd., and the latter by Babcock & Wilcox, Ltd. Base load is to be catered for normally by the large set in conjunction with the stoker-fired boilers, so achieving high efficiency on the constant load, and the idea behind the adoption of the combined system of firing is to ensure a greater measure of efficiency in the handling of superimposed peak loads. The drums for the two stoker boilers, some of the sections and the air heater are already in position, while the two pulverised-fuel boilers are now complete with all their tubes and in one case the combustion chamber had about three-quarters of its tubes in position at the time of our visit.

Foundations for the water-softening plant have already been completed and the plant contractors are expected to be on the job next month. Boiler feed water will be obtained from wells on site and after being softened and evaporated it will be conveyed to the three reserve feed water tanks which are now nearing completion. The bleed heaters are in an advanced stage of construction and two feed-water pumps await their bases.

Flue-gas cleaning on the pulverised-fuel side is to be provided for by electrical precipitating plant, the structure for which is now nearing completion, while on the stoker firing side cyclones will serve for this purpose and their structure, too, is nearly finished. We saw also on the site, but not in position, a couple of steam receivers and a host of steam pipes. The 300-ft. chimneys each have only less than 20 ft. to go. Pile driving for the supports for the coal-handling conveyors and conveyor houses in the large storage ground is complete and the coaling jetty is now about half decked and will be equipped with its two cranes which will feed the conveyors in about a month. The tremendous ash receiving pit to which the ashes will be pumped on the fluid principle is well under way.

The transformer annexe on the north side of the station is practically complete and it will accommodate the big step-up and auxiliary service transformers and the DC batteries and m.g. sets, the switchgear for controlling auxiliary services being housed in the turbine room. Good progress has also been made in the erection of 66-kV and 132-kV switching stations.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Sparkes Electrical Co., Ltd.—Private company. Registered December 14th. Capital, £100. Objects: To carry on the business of electricians and electrical contractors, wireless and television engineers, &c. The directors are: E. C. Sparkes, 34, Queen's Road, Beckenham, Kent, and three others. Registered office: 34, Queen's Road, Beckenham, Kent.

A1 Battery Co., Ltd.—Private company. Registered December 14th. Capital, £100. Objects: To carry on the business of electrical and general engineers, manufacturers of and dealers in electrical apparatus, &c. The subscribers are: J. A. Cadman, 7, Lonsdale Road, W.4, agent, and H. N. Izard, 109, Shirley Way, Croydon. The first directors are Brigadier R. H. Thomas and J. A. Cadman. Registered office: 60, St. Paul's Churchyard, E.C.4.

Quilliam & Bailey, Ltd.—Private company. Registered December 12th. Capital, £600. Objects: To carry on the business of manufacturers of and dealers in wireless receiving and transmission apparatus and instruments, gramophones, electric lamps, fires, stoves, cookers, geysers, signs, bells, clocks, &c. The permanent directors are: F. A. Quilliam and Mrs. E. E. Quilliam, both of 50, Sharples Avenue, Bolton. Registered office: 5, Blackburn Road, Bolton.

International Welding Co., Ltd.—Private company. Registered December 14th. Capital, £600. Objects: To carry on the business of electrical, mechanical, chemical and general engineers, manufacturers and merchants of electrodes, electric and other forms of welding and soldering, electro-platers, metal workers, metal fusers, &c. The subscribers are: D. E. Frean and H. S. Richardson, both of Kennan's House, Crown Court, Cheapside, E.C. Solicitors: Wild, Collins & Crosse, Kennan's House, Crown Court, Cheapside, E.C.2.

G. Coates & Co., Ltd.—Private company. Registered December 9th. Capital, £600. Objects: To carry on the business of electrical engineers and general engineering installation contractors, lighting specialists, &c. The directors are: G. W. Coates, 8, Lister Street, Grimsby; and J. W. Teasdel, 9, Wilson Street, Grimsby.

Returns of Electrical Companies

Statements of Capital

Bristol Tramways and Carriage Co., Ltd.—Satisfaction in full on October 12th, 1938, or (1) £100,000 mortgage debentures shown in statement under Section 12 1907 Act, registered September 15th, 1908, (2) deed dated February 9th, 1903, and (3) £150,000 debentures dated February 9th, 1903, and registered February 25th, 1903.

Synchronome Co., Ltd.—Capital, £7,000 in 600 preference, 5,000 2nd preference and 1,400 ordinary shares, all of £1. Return dated October 12th. 600 preference, 4,200 2nd preference and 1,400 ordinary shares taken up. £700 paid, £5,500 considered as paid. Mortgages and charges nil.

Holophane, Ltd.—Capital, £100,000 in £1 shares. Return dated October 13th. All shares taken up. £7 paid, £99,993 considered as paid. Mortgages and charges nil.

Holdsworth Electric, Ltd.—Capital, £500 in £1 shares. Return dated July 14th, 1938. All shares taken up. £500 paid. Mortgages and charges: £450.

Johnson Electricals, Ltd.—Capital, £100 in £1 shares. Return dated September 5th, 1938. Four shares taken up. £4 paid. Mortgages and charges nil.

Child's Electrical Stores, Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated September 7th, 1938. All shares taken up. £2 paid, £998 considered as paid. Mortgages and charges: £502 15s.

Hewittic Electric Co., Ltd.—Capital, £50,000 in 48,600 ordinary and 1,400 redeemable preference shares of £1. Return dated September 13th, 1938. 40,000 ordinary and 1,400 preference shares taken up. £40,000 paid, £1,400 considered as paid. Mortgages and charges nil.

Increases of Capital

British Power & Light Corporation, Ltd.—The nominal capital has been increased by the addition of £750,000 beyond the registered capital of £3,250,000. The additional capital is divided into 600,000 4½ per cent. cumulative preference and 150,000 ordinary shares of £1.

Northern Aluminium Co., Ltd.—The nominal capital has been increased by the addition of £250,000 in £1 ordinary shares beyond the registered capital of £850,000. Practically the whole of the issued share capital is held by Aluminium, Ltd., of Toronto, Canada.

Nalder Bros. & Thompson, Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares, beyond the registered capital of £30,000.

East Anglian Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £360,000 in £1 ordinary shares, beyond the registered capital of £640,000.

Receivers Appointed and Released

Electrical Measuring Instruments Co., Ltd.—C. Culpen, of 41, Kings Road, Brighton, 1, was appointed receiver and manager on November 21st, 1938, in place of Wm. J. G. Palmer under powers contained in debenture dated February 15th, 1937.

Rose & Partridge, Ltd.—A. F. C. Boyes, of 4, King's Bench Walk, E.C.4, ceased to act as receiver and manager on February 6th, 1938. (Notice filed November 15th, 1938.)

Reports and Dividends

Ismay Industries, Ltd.—In a circular issued to shareholders, the company reports the conclusion of negotiations which have resulted in a provisional agreement, which includes the sale by the company of its holding of shares in Britannia Electric Lamp Works, Ltd. The provisional agreement includes also a sale of a section of the business of John Ismay & Sons, Ltd., and was subject to the approval of the shareholders of that company at a general meeting which was to be held yesterday (Thursday). In addition the board has entered into a contract for the sale of the undertaking and assets of Ismay Cables, Ltd., one of the subsidiary companies, for completion on December 21st. It has also effected a sale of its holding in Sterling Batteries, Ltd., and is in process of concluding other arrangements affecting the affairs of the company and the other companies in which it is interested. The directors state that the effect of the above transactions will materially strengthen the resources of the company and will result in an essential reduction of its bank indebtedness. It has proved impossible to prepare the company's accounts for submission to a meeting to be held during the current year, and it is the board's intention to hold an ordinary general meeting early in the New Year, at which the accounts of the company to October 31st will be submitted. A capital reorganisation scheme involving a writing down of the ordinary share capital of the company is in contemplation, and it is anticipated that it will be possible to make some announcement regarding it at the forthcoming general meeting. The circular states that notwithstanding the substantial sales referred to above, the producing and marketing companies of the group that remain cover a wide field of activities in the electrical industry. The range of products manufactured is being increased, the sales distribution is being widened and improved and new production methods are being introduced. Important changes are taking place in the organisation and management of the various subsidiary companies and the board has been strengthened by the addition of two whole-time working directors to co-ordinate the production and sales activities of the group. The new directors, Mr. A. P. Welch and Mr. C. E. Whyatt, have had a wide experience in design, production and sales in the electrical industry. The other members of the board are Mr. T. S. Cornwell, Lt.-Col. F. A. Cortez-Leigh, and Messrs. G. S. Hewitt, W. L. Pollock-Hill and A. E. Somers (managing director).

R. A. Lister & Co., Ltd., report a trading profit for the year ended September 30th of £265,922, as compared with £204,142 in the preceding year. After providing for income tax, N.D.C., air raid provision, &c., there is a net balance of £160,531 (against £147,595). The ordinary distribution for the year is increased by 1½ per cent. to 17½ per cent., less tax. £25,000 is placed to reserve and £70,296 is carried forward (against £69,143).

Presiding at the annual meeting held on December 14th Mr. P. Lister (chairman) said that the steps taken by the directors to permit of a reduction in the prices of their chief products, to which he referred in his speech last year, had continued throughout the year under review with satisfactory results. The new mechanised foundry at Dursley had been in operation for the major portion of the year under review, and was giving results that fully justified the substantial expenditure on it. A duplicate equipment was now being installed which would enable them to double the output early in the New Year. A large proportion of the company's business was done in the export markets, and from his knowledge of this trade, based on continuous and close contact with the problems connected with it, he would like to suggest the creation of an Industrial Export Advisory Committee, similar to the Industrial Advisory Panel of Rearmament recently set up, having direct access to the Prime Minister and those Ministers concerned with our trade problems.

The General Cable Manufacturing Co., Ltd.—Presiding at the annual meeting held on December 14th Mr. C. W. R. Pantlin (chairman) said that he was somewhat disappointed at the decline in profits, even though it had been brought about by factors entirely outside their control. At this time last year he was hopeful that they would not only maintain the position of the leading independent rubber cable manufacturers in the British Isles, but would show a profit at least equal to that for the year ended September, 1937. They had, however, to face for most of the year indiscriminate and senseless price cutting. This uneconomic competition, created by a few small firms endeavouring to capture a part of their trade by undercutting, compelled them to accept many orders at a price which showed little or no profit. For the greater part of last year they were suffering acutely from that disability, but the last few months had shown an improvement and one or more firms were experiencing difficulties which had forced them to take a more reasonable attitude. Consequently, he felt more confident as to the immediate future, that confidence being accentuated by the fact that their order book showed a considerable expansion since the beginning of the new financial year. They had completed the building extension and they had entirely rebuilt their test house, which had been equipped with the latest testing apparatus.

The India Rubber, Gutta Percha and Telegraph Works, Ltd., held its seventy-fifth ordinary general meeting on Monday. Sir Walrond Sinclair, chairman of the company, who presided, said that no doubt some disappointment would have been felt at the further decline in earnings, but profits were still sufficient to cover the preference dividend twice over, while dividends on the preferred and ordinary capital had been maintained at the same rates as last year. Rebuilding of the Silvertown works had not only interfered with

continuity of production but also continually meant severe dislocation of the normal flow of manufacture, additional expenses, &c. It was not until April that the reorganisation was finally completed after three years' work. The less favourable trade conditions prevailing in recent months had prevented the company from deriving the full proportionate benefit from the economies and higher efficiency of the re-equipped works. In addition, the company had had to face higher raw material prices and increased overhead and labour charges. If allowance were made for the discontinuance of cable sales as from March 31st, 1937, the turnover was only very slightly below that of last year. The company was now in the best possible position to take advantage of every opportunity that might occur with more settled trading conditions, and provided the international political situation did not introduce further disturbing factors the directors looked forward to the future with reasonable confidence.

The British Vacuum Cleaner & Engineering Co., Ltd., reports a net profit for the year ended September 30th of £77,513, as compared with £77,282 in the preceding year, to which is added £8,450 brought in, making £85,963. From this is deducted £1,496 statutory fees and £10,000 is placed to reserve for income tax and N.D.C. As already announced, the final ordinary dividend is 30 per cent., making 40 per cent. for the year (same), and £13,717 is carried forward. The report states that the operation of the subsidiary company in Canada continues to make satisfactory progress and profit, no benefit from which has been taken into the parent company's accounts. In order to provide for further development, the directors intend shortly to make a further issue of ordinary shares to ordinary shareholders, and an announcement as to the terms on which they will be offered will be made by the chairman at the annual meeting to be held on December 30th.

The Brazilian Traction, Light & Power Co. announces that no dividend action with respect to the ordinary shares can be taken at this time because of the cessation for many months past of remittances from Brazil. An interim dividend of 50 cents was paid in July last. For the previous year there was a final dividend of 50 cents, making $1 per share (against 70 cents for 1936).

Crompton Parkinson, Ltd.—Following the annual meeting on December 17th an extraordinary meeting was held at which resolutions were passed increasing the capital to £2,000,000. The speech made by Mr. Frank Parkinson at the annual meeting had been issued in advance and was reported in our issue of December 2nd.

Thomas de la Rue & Co., Ltd., have announced an interim dividend of 6 per cent., less tax. The payment is on capital of £347,000, which includes the scrip bonus of 10 per cent. distributed in July last. For the year ended April 2nd, 1938, the dividend was 12 per cent. in one payment.

Turner & Newall, Ltd., report a net trading profit for the year ended September 30th of £1,361,694, as compared with £1,333,489 in the preceding year. N.D.C. receives £84,000, reserve £100,000, and pensions £10,000. It is proposed to maintain the ordinary dividend for the year at 20 per cent. by the final payment of 16¼ per cent., and to carry forward £116,610 (against £115,770 brought in).

The County of London Electric Supply Co., Ltd.—It is reported that the underwriters to the issue of 1,250,000 £1 ordinary shares will be called upon to take up over 40 per cent. of their commitments.

Telephone Rentals, Ltd., announce an interim dividend of 4 per cent. (same).

The Cape Town Tramways, Ltd., is paying a first and final dividend of 5 per cent. (same).

The Electric & General Investment Co., Ltd., has declared an interim ordinary dividend of 2½ per cent., less tax (same).

The London Electrical & General Trust is maintaining its interim dividend at 2½ per cent.

Stocks and Shares

TUESDAY EVENING.

THE final Stock Exchange settlement in the calendar year, concluding on the Thursday in this week, discovered little fresh in the way of business activity. The foreign political situation is still a menace to enterprise, both as regards investment and speculation. The gilt-edged list lies under the shadow of a probable National Defence Loan of substantial proportions, and one international trade index, supplied by the Cable and Wireless figures for last month, does not encourage the impression that overseas business is on the increase.

A number of new issues are known to be in contemplation for offer to the public early in the New Year. Those recently made in London have met, on the whole, with a tolerably good reception. The County of London Electric offer of 1¼ million ordinary shares at 43s. 6d. was left with the underwriters to the extent of about 45 per cent.: a result which can only be attributed to the general conditions of the times. Had these been more propitious, the shares would have been taken, it can be safely assumed, with eagerness by the shareholders and the public. As it was, the underwriters were able to get out without any difficulty or loss, for the price improved, within a few days after the allotments were out, to 3d. premium, from which it went back to the neighbourhood of "par"—that is to say, 43s. 6d. The calls are spread over some months, but dividends accrue from January 1st next on the full nominal amount of the shares. The price of the old shares, which had been depressed by the appearance of the new capital, has picked up to 44s. 6d.

Clearing the Lines

While the Transport Advisory Committee deliberates on the railways' "square deal" appeal, the market concerned attracts more attention than do most sections of the Stock Exchange at the present time. In the matter of fixing and varying transport charges, the companies' claim to equality with their competitors on the roads has been argued so well as to raise hopes of material concessions. A fairly general advance in stock prices indicates the confidence of expectations, and also a willingness to overlook the certainty of a doleful set of results for 1938 when these are published next February. Speculators have been paying most attention to those stocks on which the interest payments are on the border line of safety. Representative of the better feeling is the rise of 3 points, to 91½, in Southern 5 per cent. preference; the company's preferred stock is ½ down at 57.

Cable Manufacturing

On the impression that trading conditions have become more difficult in the cable manufacturing industry, there has been, in the last week or two, a marking down of prices in the group of shares concerned. Since the end of last month British Insulated, for instance, have gone back from 4¾ to 4½, and Callenders from 4⅛ to 3¾. In the past few days, however, the tone has become noticeably firmer. The Ismay Cables deal is said to have something to do with the improvement. That company has stood, up to now, outside the Cable-Makers' Association. But if rumour has named correctly the new owner of the undertaking, the latter will now come inside the association—to the benefit of its other members. Another consideration which has tended to subdue the group of cable shares is the delay in the introduction of legislation for the electricity supply industry. Uncertainty is said to be restricting new electrical developments, and consequently the demand for cables.

Ismay Industries Developments

While unable to have the accounts ready for a meeting this year, Ismay Industries have issued in the meantime a statement on the sale of certain of the interests. Contracts have been entered into for the sale of the Ismay Cables undertaking and of the Sterling Batteries interest. Provisional agreements have also been made for disposing of the Britannia Lamps shareholding and a section of the John Ismay & Sons' business. The result of these transactions, says the company's circular, will strengthen the financial position, and will still leave the group with a wider range of activities in the field of electrical manufacturing. A scheme for writing down the ordinary capital is in contemplation. The news went without any effect on the price of the shares, which remains at about 1s. 3d. Now rumour is busy naming the other parties to the various contracts.

New Issues

Market conditions being still unfriendly to the would-be borrower of capital, prospectuses relating to new issues remain few and far between. Such as do make their appearance depend generally on security for their appeal. Of recent issues in the electrical markets, the British Light and Power 4½ per cent. preference shares stand at the price of 21s., at which they were offered and oversubscribed. The new North Metropolitan Electric 4 per cent. preference stock is at 3d. discount on the prospectus price of 20s. In this case the underwriters were called on to take up about 40 per cent. of the issue. Taylor Tunnicliff 5½ per cent. preference shares, offered at 21s., are changing hands at around that price. Among the less recent offers London Power 3¾ per cent. debentures are at a discount of 2 on the issue price of 98½.

Miscellaneous Matters

Steadiness has returned to the electricity supply market after the previous week's hesitancy. Interest is occupied with the movement on foot to allay, by means of a short Bill in Parliament, some of the uncertainties which are claimed to be holding up the industry's development during the wait for full legislation.

In announcing its inability to declare a dividend at the present time, the Brazilian Traction company provides another example of the trials which currency restrictions impose on stockholders in many South American enterprises. The decision is due to the absence, for many months, of remittances from Brazil. After rising momentarily to 11 on hopes of some cash payment—50 cents was paid at this time last year—the price of the shares relapsed to 9¼ when the news became known. Repurchases by the bear brigade caused a recovery to 9¾. Rio 5 per cent. bonds declined sympathetically from 60 to 55.

Cable and Wireless ordinary stock found supporters at last week's very depressed level, but the appearance of the traffics index for November scotched the recovery movement. Traffics declined to the lowest ebb on record for the month, bringing the average of this year's indices to 68.6, or 10 points below 1937. On balance, the ordinary stock is a point better, at 35½, but the preference has gone back from 79 to 77¾. Industrial markets have had a quiet week with few outstanding price movements. In the gilt-edged market, on the other hand, the downward tendency of prices is marked. London Passenger Transport prior-charges are, however, better. American markets have failed to recapture the bullish spirit engendered at first by Mr. Roosevelt's rebuff at the November elections. From the undecided behaviour of Wall Street it seems that anxiety over the European situation tends to balance, in its effect, the hopeful view which is taken of American domestic activity.

Electrical Companies' Shares

Prices, dividends and yields

Company.	1938. High-est.	1938. Low-est.	Dividend. Pre-vious.	Dividend. Last.	Price Dec. 20	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.							
Bournemouth and Poole ...	68/3	62/–	15	15	67/6	—	4 9 0
British Power & Light ...	30/9	24/6	6	7	28/–	—	4 18 3
City of London	34/6	28/6	7½	7½	32/–	—	4 13 9
Clyde Valley	42/6	33/–	8	8	36/3	—	4 8 2
County of London... ...	51/9	38/9	10½	10½	44/6	+6d.	4 14 5
Edmundson's :							
7% Pref....	33/3	30/–	7	7	31/3xd.	+6d.	4 9 6
Ord.	40/9	18/9	9	9	25/6	—	—
Elec. Dis. Yorkshire ...	43/6	37/9	9	9	41/3	—	4 7 5
Elec. Fin. and Securities...	51/9	49/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation...	55/–	50/–	12	12	51/3	–⅛	4 13 5
Isle of Thanet	21/3	18/6	4	4	20/–	—	4 0 0
Lancs Light and Power ...	35/–	28/–	7½	7½	30/9	–6d.	4 17 7
Llanelly Elec.	23/6	21/–	5½	5½	21/6	—	5 2 4
Lond. Assoc. Electric ...	32/9	28/–	7	7	30/–	—	4 13 4
London Electric	36/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red.	108¾	100	5	5	106	—	4 14 6
Metropolitan	51/–	41/–	10	12	48/3	—	4 19 7
Midland Counties	39/9	33/–	8	8	35/9	–6d.	4 9 6
Mid. Elec. Power	41/9	37/–	8	9	40/–	—	4 10 0
Newcastle Elec.	31/9	27/6	7	7	28/9	—	4 17 4
North Eastern Electric :							
Ordinary...	34/–	25/–	7	7	30/–	—	4 13 4
7% Pref....	34/–	30/–	7	7	32/–	–6d.	4 7 6
Northampton	47/6	43/9	10	10	46/3	—	4 6 7
Notting Hill 6% Pref. (£10)	14½	13½	6	6	13½xd.	+4/6	4 12 4
North Met. Elec. :							
Ordinary...	49/–	43/–	10	10	45/–	–9d.	4 9 0
6% Pref.... ...	30/6	28/3	6	6	29/6	—	4 1 4
Richmond Elec.	30/6	28/–	7	7	28/9	—	4 17 5
Scottish Power	38/9	32/–	8	8	35/–	—	4 11 6
Southern Areas	22/9	18/6	4½	5	21/3	—	4 14 1
South London	32/6	31/–	7	7	31/6	—	4 9 0
West Devon	23/3	21/3	5	5	1⅛	—	4 9 0
West Glos.	19/–	16/9	2	2	19/6	+6d.	2 1 0
Yorkshire Elec.	42/–	36/9	8	8	38/6	—	4 3 0
Overseas Electricity Companies.							
Atlas Elec.	4/6	2/6	Nil	Nil	2/9	—	—
Calcutta Elec.	44/3	36/3	12*	10*	2	—	5 0 0
Cawnpore Elec.	40/–	35/–	10	10	36/3	—	5 10 6
East African Power ...	28/3	22/6	7	7	24/–	—	5 16 8
Jerusalem Elec.	26/9	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	12/–	9/6	7½	7½	10/3	—	7 6 4
Madras	34/6	28/9	8*	8*	30/–	—	5 6 8
Montreal Power	31¾	26¾	1½	1½	32½	—	—
Palestine Elec. "A" ...	31/9	27/–	7½*	7½*	30/–xd.	+6d	5 0 0
Perak Hydro-electric ...	25/3	17/–	7	6	18/9	—	6 8 1
Shawinigan Power ...	23½	16½	65cts.	85cts.	21½	–½	—
Tokyo Elec. 6%	65½	39	6	6	55½	–2	10 16 2
Victoria Falls Power ...	76/3	55/–	12	13½	68/3xd.	—	3 19 2
Whitehall Investments Pref.	22/3	15/–	7½	7½	17/6	—	8 11 6
Public Boards.							
Central Electricity :							
1950–70	115¾	107	5	5	110½	—	4 10 6
1955–75	118½	100	5	5	113½	—	4 8 1
1951–73	111	95	4½	4½	106½	–½	4 4 6
1963–93	101	85	3½	3½	95½	—	3 13 4
London Elec. Trans. Gtd.	93½	88	2½	2½	89½	—	2 15 10
London & Home Counties,							
1955–75	112¾	97½	4½	[4½	110	—	4 1 10
Lond. Passenger Transport :							
A	119½	104¾	4½	4½	110½	+1	4 1 5
B	122½	105	5	5	115½	+1	4 6 7
C	84	68	4½	4	74½	–½	5 7 5
West Midlands Joint Elec.,							
1948–68	115½	102½	5	5	113	—	4 8 6
Telegraph and Telephone.							
American Tel. & Tel. ...	154½	114	9	9	158½	—	5 13 7
Anglo-Am. Tel. :							
Pref.	115½	100½	6	6	100½	—	5 19 5
Def.	28	23	1½	1½	23½	+½	6 7 8
Anglo-Portuguese	23/6	19/3	8	8	21/3	—	7 10 7
Cable & Wireless :							
5½% Pref.	104	78	4½	5½	77½	–1½	7 2 0
Ord.	67½	34	—	4	35½	+1	11 4 4
Income	102½	99	—	—	99½	—	4 0 5
Canadian Marconi $1 ...	6/6	3/9	—	Nil	4/9	—	—
Globe Tel. & Tel. :							
Ord.	32/6	26/3	5½*	7½*	25/9	–6d.	5 16 6
Pref.	27/6	23/9	6	6	26/3	—	4 11 5
Great Northern Tel. (£10)...	42½	34	20	20	37	+½	5 8 1
Inter. Tel. & Tel.	12½	5¾	Nil	Nil	10	+½	—
Marconi-Marine	30/6	21/6	10	7½	23/9	—	6 6 4
Oriental Telephone Ord. ...	59/3	2½	12*	12*	2¾	—	4 11 3
Radio Corpn.	9½	4¾	8	6	8	—	—
Telephone Props	13/9	11/3	5	6	12/6	—	9 12 0
Telephone Rentals (5/–) ...	10/–	7/6	5	6	9/3	—	3 4 10
Western Union	34½	17	2½	—	24½	—	—
Traction and Transport.							
Anglo-Arg. Trams :							
First Pref.	11/–	2/6	Nil	Nil	3/9	—	—
4% Inc.	31	8	Nil	Nil	9	—	—
British Electric Traction :							
Def. Ord.	1060	675	5	5	900	—	—
Pref. Ord.	175	150	8	8	160	–5	5 0 0
Bristol Trams	45/–	34/3	5	8	40/9	–9d.	3 18 6
Brazil Traction	14½	7⅛	70cts.	$1	9⅞	–¼	—
Calcutta Trams	26/9	21/6	8	8	24/6	—	6 10 8
Cape Elec. Trams	18/6	15/6	5	6	17/6	—	6 17 2
Lancs Transport	35/3	29/3	10	10	36/3	—	5 10 3
Mexican Light :							
1st Bonds	39	16½	5	5	25	—	—
Rio 5% Bonds	91	47	5	5	55	–5	9 1 10
Southern Rly :							
5% Prefd.	87	48	5	—	57	–½	—
5% Pref.... ...	116	83	5	5	91½	+3	5 9 3
T. Tilling	60/–	36/6	10	10	42/6	—	4 14 1
Tilling & B.A.	57/–	46/–	6	10	50/–	—	4 0 0
West Riding	46/3	30/6	10	10	33/9	—	—
Equipment and Manufacturing.							
Aron Electricity Ord. ...	40/3	31/–	15	15	1⅛	—	9 12 0
Assoc. Elec. :							
Ord.	45/3	32/–	10	10	39/–	—	5 2 8
Pref.	38/9	35/6	8	8	36/–xd.	—	4 9 0
Automatic Telephone & El.	43/–	35/–	5	10	41/3	—	4 17 1
Babcock & Wilcox ...	44/–	32/6	10	10	35/9	—	5 11 8
British Aluminium Ord. ...	54/–	40/–	10	12½	54/6	—	4 11 9
British Insulated Ord. ...	95/9	77/–	20	20	4½	—	4 16 10
British Thermostat (5/–) ...	16/–	9/–	17½	18½	15/9	—	5 17 6
British Vacuum Cleaner ...	35/9	27/–	5	6	27/–xd.	—	4 9 0
Brush Ord.	5/6	4/9	Nil	Nil	5/–	—	—
Callender's	5½	78/6	20	20	77/6	—	5 3 3
Chloride Elec. Storage ...	77/9	61/–	15	20	77/6	—	5 3 3
Consolidated Signal ...	116/–	75/–	30	36½	4¾	—	7 13 7
Crabtree (10/–)	29/–	22/–	17½	17½	23/9	–9d.	7 7 4
Crompton Parkinson :							
Ord. (5/–)	32/3	18/9	12½	15	23/6	–6d.	3 3 10
E. K. Cole (5/–)	8/9	4/6	5	10	6/–	—	8 6 8
Elec. & Musical Industries (10/–)	16/3	9/–	10	5	11/–	—	4 11 0
Electric Construction ...	36/–	31/–	10	12½	32/6	—	7 13 10
Enfield Cable Ord. ...	5⅝	46/–	25	25	2⅛	–⅛	—
Electrical Switchgear (10/–)	27/–	22/6	16	16	25/9	—	6 4 4
English Electric	33/–	24/6	Nil	10	33/–	—	6 1 3
Ensign Lamps (5/–) ...	14/3	11/3	—	25	14/–	—	8 18 6
Ericsson Tel. (5/–)... ...	2⅜	31/–	25*	25*	38/9	–⅛	3 4 6
Ever Ready (5/–)	26/3	16/6	45	35	21/–	—	8 6 8
Falk Stadelmann	34/3	27/–	10	10	27/6	—	7 5 6
Ferranti Pref.	27/6	25/–	7	7	25/–xd.	–1/6	5 12 0
G.E.C. :							
Pref.	34/–	31/3	6½	6½	31/3	—	4 3 2
Ord.	79/3	67/–	17½	20	76/6	–6d.	5 4 7
Greenwood & Batley ...	27/6	19/–	7	15	26/3xd.	+6d.	11 8 6
Hall Telephone (10/–) ...	24/6	18/3	5	15	21/3	—	7 1 2
Henley's (5/–)	21/–	16/–	15	20	19/6	—	5 2 7
4½% Pref.	23/–	22/–	4½	4½	22/6	—	4 0 0
Hopkinsons	40/–	32/6	10	12½	38/9	—	6 8 10
India-Rubber Pref. ...	21/9	20/3	5½	5½	21/3	—	5 3 6
Intl. Combustion	5/8	4½	30	32½	5⅜	–½	6 0 10
Ismay Industries (5/–) ...	6/9	1/–	6	6	1/3	—	—
J. Lucas	57/9	47/6	15	15	56/3	—	5 6 9
Johnson & Phillips ...	43/9	32/6	10	12½	36/3	—	6 13 4
Lancashire Dynamo ...	72/3	53/–	20	25	65/–	—	7 14 0
Laurence Scott (5/–) ...	12/–	9/–	7	15	12/–	—	6 5 0
London Elec. Wire ...	35/–	28/3	12	7½	30/–	+6d.	5 0 0
Mather & Platt	49/–	41/3	12	13½	46/3	—	5 17 0
Metropolitan Elec. Cable Pf.	22/–	21/–	5½	5½	21/3	—	5 3 6
Murex	93/9	66/3	20	20	77/6	—	5 3 3
Pye Deferred (5/–) ...	12/–	8/–	5	25	9/6	—	13 3 2
Revo (10/–)	36/3	30/–	12	17½	35/–	—	5 0 0
Reyrolle	62/6	49/–	12½	12½	55/9	—	4 10 0
Siemens Ord.	31/–	20/6	7½	7½	22/6	–⅛	6 13 4
Strand Elec. (5/–) ...	6/–	4/–	5	10	5/–	—	10 0 0
S. Smith (1/–)	9/9	6/3	37½	50	8/9	—	6 6 0
Switchgear & Cowans (5/–)	19/6	12/6	20	20	15/–	—	6 13 4
Telegraph Condenser (10/–)	18/9	12/–	5	5	12/6	—	4 0 0
Telegraph Construction ...	2½	36/–	7½	10	2½	—	4 14 1
Telephone Mfg. (5/–) ...	9/9	7/–	9	9	8/9	—	5 2 10
Tube Investments... ...	89/6	70/–	23¾	23¾	4½	—	5 15 6
Vactric (5/–)	9/9	4/6	10	10	4/6	–6d.	11 2 2
Vickers (10/–)	27/–	17/6	10	10	22/–	–6d.	4 11 0
Westinghouse Brake ...	63/9	45/–	15	17½	54/–	—	6 9 8
Walsall Conduits (4/–) ...	26/–	22/6	—	55	25/9	—	8 11 0
West, Allen (5/–)	6/6	4/6	—	7½	6/6	—	5 15 5

* Dividends are paid free of Income Tax.

New Patents

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

5336. "Cores for inductance coils." Steatit-Magnesia. Akt.-Ges. February 22nd, 1936 (Cognate application 5337/37). (495866.)

5590. "Electric braking systems." British Thomson-Houston Co., Ltd. February 25th, 1936. (496208.)

7372. "Apparatus for determining electrically the direction, and, if desired, the value of the dip of the formations cut by a bore hole." Soc. de Prospection Electrique (Procédés Schlumberger). March 18, 1936. (495867.)

8169. "Electric-discharge devices." British Thomson-Houston Co., Ltd., and D. Gabor. March 19th, 1937. (Addition to 442307.) (495870.)

8213. "Current convertors." Siemens-Schuckertwerke Akt.-Ges. March 24th, 1936. (496112.)

8488. "Electrodeposition of metals." A. R. Thomas. March 23rd, 1937. (Cognate application 9129/37.) (496113.)

11607. "Television and like transmitting systems." E. L. C. White. April 23rd, 1937. (496119.)

11650. "Electric circuits for use in connection with discharge lamps." Scophony, Ltd., and J. H. Jeffree. April 23rd, 1937. (496121.)

13937. "Wireless receiving systems." W. A. Beatty. May 19th, 1937. (496123.)

14214. "Electrical resistances having negative temperature coefficients." British Thomson-Houston Co., Ltd. May 21st, 1936. (496210.)

14296. "Circuit breakers for use with speed indicators and revolution counters." British Thomson-Houston Co., Ltd., and L. Griffiths. May 22nd, 1937. (495963.)

14327. "Direction-finding radio receiving systems." Marconi's Wireless Telegraph Co., Ltd. January 11th, 1937. (496129.)

14441. "Telephone systems." Associated Electric Laboratories, Inc. June 19th, 1936. (496138.)

14443. "Alternating-current machines." A. D. Blumlein. May 24th, 1937. (496139.)

14503. "Rectifier circuit arrangement for television purposes." Radioakt.-Ges. D. S. Loewe. May 27th, 1936. (Cognate application 14504/37.) (496213.)

14528. "Direction-finding radio receiving systems." Marconi's Wireless Telegraph Co., Ltd., and W. A. Appleton. May 25th, 1937. (496217.)

14566. "Indicators, particularly for radio-receiving apparatus." L. F. Birdseye. May 26th, 1937. (495879.)

14606. "Radio receivers combined with clocks." W. A. Beatty. May 26th, 1937. (496053.)

14607. "Wireless reception." W. A. Beatty. May 26th, 1937. (496140.)

14628. "Tuning of radio receivers." Murphy Radio, Ltd., and J. D. A. Boyd. May 26th, 1937. (496275.)

14659. "Printing-telegraph systems." British Tabulating Machine Co., Ltd. (International Business Machines Corporation). May 26th, 1937. (496227.)

14740. "Systems of speed control for electric motors." British Thomson-Houston Co., Ltd. May 29th, 1936. (495880.)

14753. "Electric-discharge lamps, comprising materials adapted to be excited to luminescence by radiation from the discharge." General Electric Co., Ltd., J. T. Randall, and J. W. Ryde. May 27th, 1937. (496143.)

14848. "Oscillograph scale systems." Standard Telephones & Cables, Ltd., R. F. Cleaver, I. R. J. James, and C. F. A. Wagstaffe. May 28th, 1937. (496238.)

14849. "Wireless direction-finding systems." Standard Telephones & Cables, Ltd., and C. F. A. Wagstaffe. May 28th, 1937. (496239.)

14871. "Manufacture and production of cores for inductive apparatus." G. W. Johnson (I.G. Farbenindustrie Akt.-Ges.). May 28th, 1937. (496057.)

14897. "Radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd. May 28th, 1936. (496246.)

14916. "Thermostat with dry contacts." Electro-Appareillage. May 28th, 1936. (495973.)

14951. "Electric switches for the remote control of contactor and other protective switchgear, electric motor-starters and the like." J. A. Crabtree & Co., Ltd. (Schiele Industrie Werke). May 29th, 1937. (496061.)

14995. "Radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd. May 29th, 1936. (496145.)

15195. "Electric regulating switches employing a conducting liquid." English Electric Co., Ltd., J. E. Calverley, H. S. Pound-Corner and H. B. Sedgfield. June 1st, 1937. (495882.)

15202/3. "Pivotal bearings for electricity meters." Siemens Bros. & Co., Ltd., and L. O. Deacon. June 1st, 1937. (495883/4.)

15374. "Electrical signalling systems." Ericsson Telephones, Ltd., and F. Limb. June 3rd, 1937. (496063.)

15588. "Electrically actuated organs." A. L. Bird. June 4th, 1937. (495974.)

16278. "Ultra-short-wave transmission systems." Standard Telephones & Cables, Ltd. July 21st, 1936. (495977.)

16451. "High-pressure metal-vapour electric-discharge devices." General Electric Co., Ltd., and V. J. Francis. June 14th, 1937. (495978.)

17200. "Thermally responsive protective devices for electrical apparatus." English Electric Co., Ltd., L. Roberts and R. D. Ball. June 21st, 1937. (Cognate application 26516/37.) (495888.)

17392. "Electrical meters." T. B. Somerville, T. E. Allibone and Metropolitan-Vickers Electrical Co., Ltd. June 22nd, 1937. (495890.)

17848. "Starting of direct-current motors." Cantieri Riuniti dell'Adriatico, Cantiere Monfalcone. June 27th, 1936. (495893.)

21250. "Electric radiator." S. N. Maxfield. July 31st, 1937. (496076.)

22071. "Switch cases, junction boxes and like fittings for electricity distributing systems." R. Bain and N. Allday. August 11th, 1937. (495899.)

22852. "Synchronisation of television scanning means." Radio Akt.-Ges. D. S. Loewe. August 21st, 1936. (495902.)

24030. "Frequency-mixing circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. December 1st, 1936. (496154.)

24079. "Electromagnetically operated plungers." J. V. Payne and London Passenger Transport Board. September 3rd, 1937. (495989.)

24343. "Instantaneous electric water-heating apparatus." R. Dight. September 7th, 1937. (496155.)

25705. "Telephone transmission systems." F. W. Hyde and F. Hyde. September 22nd, 1937. (495904.)

25876. "Electric-discharge devices." General Electric Co. (Patent Treuhand Ges. für Elektrische Glühlampen.) September 23rd, 1937. (Cognate application 11037/38.) (495905.)

28777. "Alternating-current inductive regulating apparatus." Siemens & Halske Akt.-Ges. December 18th, 1936. (495996.)

29377. "Indicating devices associated with high-frequency generators." M. P. Petersen. October 27th, 1937. (495911.)

29641. "Transmission control in signalling systems." Standard Telephones & Cables, Ltd. October 29th, 1936. (495912.)

31795. "Means for controlling the parallel operation of electrical apparatus." Allmanna Svenska Elektriska Aktiebolaget. (A. Arvidsson.) November 18th, 1937. (496000.)

31981. "Direct-reading radiogoniometers." J. Marique and Soc. Anon Internationale de Télégraphie sans Fil. January 15th, 1937. (Cognate application, 31982/37.) (496001.)

34133. "Thermionic cathodes." Zeiss Ikon Akt.-Ges. December 22nd, 1936. (495916.)

1938

436. "Construction of deflection plates for cathode-ray tubes." V. Zeitline, A. Zeitline, and V. Kliatchko. February 20th, 1937. (495919.)

677. "Apparatus for the electrical protection of gaseous discharge-tube installations." H. E. M. Barlow. January 10th, 1938. (496083.)

691. "Electro-medical apparatus for ray treatment." I. Sleidinger. January 10th, 1938. (496167.)

1312. "Electric transformers." Soc. Anon Transformateurs de Mésure E. Walter. January 14th, 1937. (495921.)

1701. "Electrically controlled extensible chairs and like devices." O. H. Pieper and A. F. Pieper. February 4th, 1937. (495925.)

2980. "Electric-discharge tubes containing luminous screens." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 3rd, 1937. (496085.)

4708. "Electric wave filters." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 18th, 1937. (495928.)

4877. "Electric cables." Allgemeine Elektricitäts-Ges. February 16th, 1937. (495929.)

5342. "Electric warning device for pipe lines containing gas under pressure." J. A. Jobling & Co., Ltd., and C. K. Dobbing. February 21st, 1938. (495930.)

6252. "Telephone systems having two-party lines." Telefonaktiebolaget L. M. Ericsson, H. V. Alexandersson and O. G. R. Siewert. February 28th, 1938. (496172.)

6571. "Iconoscopes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 5th, 1937. (496018.)

6703. "Electric lamp sockets." British Thomson-Houston Co., Ltd. March 3rd, 1937. (496019.)

6835. "Insulating liquids for electric apparatus." British Thomson-Houston Co., Ltd. March 6th, 1937. (496020.)

7244. "Electrical insulating materials." British Thomson-Houston Co., Ltd. March 10th, 1937. (496174.)

7844. "Lighting of buildings." Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St. Gaboin, Chauny & Cirey. March 12th, 1937. (496092.)

7886. "Envelopes of electric lamps and discharge tubes." British Thomson-Houston Co., Ltd. March 13th, 1937. (496021.)

8696. "Regulation of electric supply stations working in parallel." Akt.-Ges. Brown, Boveri & Cie. March 19th, 1937. (495937.)

8943. "Electric selective signal receiving arrangements." Standard Telephones & Cables, Ltd. March 23rd, 1937. (495940.)

10089. "Self-inductance devices." C. Lorenz-Akt.-Ges. April 3rd, 1937. (495941.)

11110. "Electromagnet for telegraphic machines." C. Olivetti & Co., Soc. Anon., Ing. July 27th, 1937. (496180.)

11551. "Circuits for reducing distortion with degenerative reaction." Standard Telephones & Cables, Ltd. May 4th, 1937. (495943.)

12125. "Time-limit relay." Allmänna Svenska Elektriska Aktiebolaget. November 20th, 1937. (495948.)

12228. "Apparatus for electric-welding annular joints." H. F. M. Hollesden. April 24th, 1937. (496095.)

13753. "Testing devices for electric insulators." Compagnie Générale d'Electro Ceramique. May 8th, 1937. (Cognate application, 13754-38.) (495951.)

14047. "Directive radio antenna systems." Standard Telephones & Cables, Ltd. June 23rd, 1937. (496027.)

15370. "Electrolytic purification of aluminium." Aluminium Industrie Akt.-Ges. June 3rd, 1937. (496028.)

15707. "Electrically operated volumetric weighing apparatus for granular materials." Soc. des Compteurs Volumetriques. November 4th, 1937. (496190.)

15762. "Electrodes for electric arc convertors." British Thomson-Houston Co., Ltd. May 26th, 1937. (496033.)

20020. "Electric high-pressure-metal-vapour discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 9th, 1937. (496037.)

27799. "Telephone and like electric signal transmission systems." Standard Telephones & Cables, Ltd., B. B. Jacobsen, and F. Fairley. March 25th, 1937. (Divided out of 494418.) (496265.)

Contract Information

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Australia.—MELBOURNE.—January 31st. Postmaster-General's Department. Telephone relays. (T. 30041/38.)*
January 23rd. City Council. Supervisory indicating equipment. (T. 29004/38.)*
April 26th. State Electricity Commission. 30,000-kW turbo-generating plant, condensing plant, pipework and accessories. (December 16th.)

Belfast.—January 13th. Electricity Department. Stores and materials for twelve months. (December 16th.)

Birmingham.—January 11th. Salvage and Stables Committee. Fifteen lead-plate batteries for electric refuse collection vehicles. (See this issue.)

Bridlington.—December 23rd. Town Council. Electrical wiring installation at the new electricity showrooms and offices, Quay Road. (December 16th.)

Brighton.—January 4th. Electricity Undertaking. One 5,000-kVA, 33/11kV outdoor type transformer. (December 16th.)

Chelmsford.—December 29th. Essex County Council. Electrical installation at the Agricultural College and Hostels at Writtle. (December 16th.)

Chigwell.—December 31st. U.D.C. Disintegrating pump for screening and a low-lift effluent pump, together with electric motors. Howard Humphreys and Sons, 17, Victoria Street, London, S.W.1 (deposit £2 2s.).

Dublin.—January 18th. Electricity Supply Board. P.i. cables for twelve months. (See this issue.)

Ebbw Vale.—December 31st. Education Committee. Work on heating apparatus at Duffryn schools, including provision of circulating pump and electric motors. P. Davies, Council Offices (deposit £1 1s.).

Exeter.—January 3rd. Electricity Department. Three four-panel, 11,000-V metal-clad switchboards. (December 9th.)

Gloucestershire.—Education Committee. Electric lighting in new infants' council school at Kingswood, Bristol. County architect, Shire Hall, Gloucester.

Halifax.—December 31st. A.R.P. Committee. Electrical work in connection with the adaptation of existing buildings at Stoney Royd as storage depot. Town Clerk, Town Hall (deposit £1 1s.).

India.—NEW DELHI.—January 3rd. Indian Stores Department. One Diesel-engine driven generator with static balancer. (T.Y. 29676/38.)*
CALCUTTA.—January 14th. Indian Stores Department. Three Diesel-engine driven generators and complete power-house equipment. (T.Y. 29677/38.)*
NEW DELHI.—January 5th. Indian Stores Department. Underground cable. (T. 30294/38.)*

Kent.—January 17th. County Council. Internal telephone systems at Chatham County Hospital and the Gravesend, Malling and Sundridge Institutions. Broadcast bells and buzzer systems at Farnborough, Sheppey and Chatham County Hospitals. (December 16th.)

London.—BETHNAL GREEN.—January 20th. Electricity Department. Extra-high-voltage switchgear for one of the council's sub-stations. (December 16th.)
H.M. OFFICE OF WORKS.—January 6th. Installation of low-voltage, telephone and fire alarm cables at Bridgend, Brackla Hill R.O.F. (December 16th.)

Manchester.—December 30th. Electricity Department. Fire-extinguishing equipment for switch houses, transformer chambers, cable passages, &c., at Dickinson "B" sub-station. (December 9th.)

Morley.—January 9th. Electricity Department. Cables, meters, joint boxes, service cut-outs, transformers, cookers, kettles, radiators, wash boilers, water heaters, immersion heaters, lamps and street lighting equipment for twelve months. (December 16th.)

Newcastle-on-Tyne.—January 21st. Transport and Electricity Committee. High-voltage, lead-cased, p.i. cable. (December 16th.)
City Council. Installation of electric lighting at the isolation block at the Walkergate City Hospital. Plans by R. G. Roberts, city architect, 18, Cloth Market.

Newport.—Electrical work for new police station and law courts at the Civic Centre. Albion T. Snell & Partners, Suffolk House, Laurence Pountney Hill, Cannon Street, E.C.4.
Electricity Department. 10,000 electric lamps. A. Nichols Moore, electrical engineer, Electric House, Dock Street.

New Zealand.—WELLINGTON.—February 3rd. Posts and Telegraph Department. Twelve 230/25-V step-down transformers. (T. 30045/38.)*
February 3rd. Quantities of telephone cable. (T. 30104/38.)*
February 1st. 300 miles of cable. (T. 29810/38.)*
January 31st. Public Works Department. Quantities of 400-V cable. (T. 30048/38.)*

Royton.—January 9th. U.D.C. Installation of street lighting: Oldham and Rochdale Roads (sodium) and Higginshaw Lane and Heyside (mercury). (December 16th.)

Saltcoats (AYRSHIRE).—December 3rd. Town Council. Electrical installation at forty-eight houses. Joint Town Clerks (deposit £1 1s.).

Sheffield.—January 12th. Electricity Department. Pipework, tanks, valves, &c., in connection with a 50,000-kV turbo-alternator. (December 16th.)

Skipton.—January 2nd. Electricity Department. One 11-kV and one low-voltage six-panel switchboard, and two 400-kVA indoor type transformers. (December 9th.)

South Africa.—PRETORIA.—January 12th. Union Tender and Supplies Board. Radio receivers. (T. 29591/38.)*
January 19th. Inter-office telephone communication system. (T. 30013/38.)*
JOHANNESBURG.—December 28th. City Council. One electric lift. (T. 30000/38.)*
January 18th. 260 10-A, 220-V house service electricity meters. (T. 30264/38.)*
PORT ELIZABETH.—January 12th. City Electrical Engineer's Department. Low-voltage cables, tubular steel poles and street-lighting fittings. (T.Y. 30151/38.)*

Stranraer.—January 18th. Town Council. Electrical fittings at 100 houses. Town Clerk (deposit £1).

Torquay.—January 10th. Borough Council. Complete pumping installations comprising four, two and three pumps, together with electric motors and control equipment, pipes, steel floors, crane and all necessary accessories. H. A. Hield, Town Clerk, Town Hall (deposit £5 5s.).

Uruguay.—MONTEVIDEO.—January 11th. State Electricity Supply and Telephones Administration. Various metering instruments and apparatus. (T.Y. 30102/38.)*

Wakefield.—January 2nd. County Council of the West Riding of Yorkshire. Installation of water heating apparatus and electric lighting at Hatfield new senior school and extensions at Mexborough Doncaster Road school. Electric lighting installation at Hatfield Woodhouse school. Clerk of the County Council, County Hall.

Orders Placed

Aberdeen.—Town Council. Accepted. Electrical work at fifty-six houses being built on the Tullos estate (£365).—Stroud & Weir.

Birkenhead.—Electricity Committee. Accepted. Wiring installations: Thirty-seven houses (£166).—Park Electrical Co. Twenty-two houses (£99).—J. J. Peters.

Birmingham.—Public Assistance Committee. Accepted. Electrical work at additions to Erdington House (£1,452).—Electromobile Engineering Co.

Blackpool.—Electricity Committee. Accepted. 6,600-V switchgear for twelve months.—Switchgear & Cowans. Transformers for twelve months.—Lindley Thompson Transformer & Service Co.

Bootle.—Finance Committee. Accepted. Telephone equipment at Town Hall (£120).—Automatic Telephone & Electric Co.

Dartford.—Electricity Committee. Recommended. Cooker wiring.—W. J. Bayliss.

Fife.—County Council. Accepted. Electrical work for thirty-six houses at Wellwood, Dunfermline.—Miller & Stables.

Glasgow.—Education Committee. Accepted. Electrical work at Househillwood school (£523).—Kennedy Stark & Co.

Hebden Royd.—U.D.C. Accepted. Electrical work for fifty-two houses in Nest Lane, Mytholmroyd.—A. Tattersall.

London.—L.C.C. Housing and Public Health Committee. Recommended. Wiring and fittings for electric lighting in two further blocks of dwellings in the High Hill Ferry area, Hackney (£1,073).—Jacob, White & Co.
L.C.C.—Accepted. Wiring and fittings for electric lighting installations: 837 houses and flats at Becontree, Dagenham area (£6,021).—Newman & Watson. Blocks of dwellings on the King's Mead estate, Hackney (£4,937).—Coleby & Co. Houses and flats at Downham, Lewisham area (£6,337).—Rylands Electrical Co. Page's Walk school (£1,144).—Newman & Watson. Rewiring of the internal telephone and impulse clock systems at St. Charles' Hospital, Kensington (£517).—Read & Partners.
WESTMINSTER.—Highways Committee. Recommended. Electric van (£355).—Electricars.
STEPNEY.—Finance and Parliamentary Committee. Recommended. Apparatus in connection with the extension of Limehouse generating station: Two 2,000-kVA transformers (£1,800) and two 800-A metal-clad units to line up with a six-panel switchboard (£242).—G.E.C. Two low-voltage oil-immersed circuit-breakers (£1,041) and one 22-circuit, six 10-circuit and one 6-circuit distribution switchboards (£670).—Met.-Vick. Electrical Co. Extra-high-voltage bus-bars for Beccles Street sub-station (£163).—A. Reyrolle & Co.
Finance and Parliamentary Committee. Equipment for twelve months in connection with the Council's hire-purchase scheme:—
1,000 1½-gal. water heaters and 350 10-gal. wash boilers:

WATER HEATERS

	£
Thermics, Ltd. Recommended ...	**2,827**
H. Webb, & Co. (Engineers) ...	3,247
Santon, Ltd.	3,530
Ferranti, Ltd.	3,555

WASH BOILERS

	£
Revo Electric Co.	726
Do. (with improved elements)	1,102
Brailsford Bros. (with improved elements). Recommended ...	**853**
Burco, Ltd.	892
General Electric Co.	930
Jackson Electric Stove Co. ...	1,067

40,000 yd. of 250-V v.i.r. cable and 247,000 yd. of 250-V tough-rubber-sheathed cable:

V.I.R. CABLE

	£
Wm. Geipel. Recommended ...	**468**
Wholesale Fittings Co.	505
Hackbridge Cable Co.	531
Mersey Cable Works	537
Wilec, Ltd.	550
Metropolitan Electric Cable & Construction Co.	1,083

T.R.S. CABLE

	£
Wholesale Fittings Co. Recommended	**2,776**
Wm. Geipel.	2,805
Hackbridge Cable Co.	3,429
Mersey Cable Works	3,591
Wilec, Ltd.	3,595
Metropolitan Electric Cable & Construction Co.	8,099

5-A one-way and two-way switches (80 gross and 15 gross respectively):

	£
C. H. Parsons, Ltd. Recommended	**386**
M.K. Electric	386
J. H. Tucker & Co.	402
J. A. Crabtree & Co.	402

10 gross of cooker control units:

	£
Wholesale Fittings Co. Recommended	**954**
J. A. Tucker & Co.	954
J. H. Crabtree & Co.	972
M.K. Electric	1,008
Revo Electric Co.	1,026
Wilec, Ltd.	1,098
Arrow Electric Switches... ...	1,116
Bill Switchgear	1,314
Simplex Electric Co.	1,368
General Electric Co.	1,494

Rochdale.—Town Council. Accepted. Electrical work in connection with the market hall and shops scheme (Section 2).—Fryer & Hartley.

Selston.—Parish Council. Accepted. Installation of electric lighting in the Council offices.—A. Ford & Co.

Southend.—Assistance Committee. Acceptde. Fire alarms at institution (£150).—Standard Telephones & Cables.

Surrey.—Hospitals Committee. Accepted. Electric cables at St. Helier Hospital (£10,923).—T. Clarke & Co. Electrical work at Farnham Hospital (£748).—E. C. Stokes. Rewiring Tetherne Hospital (£3,066).—Buchanan & Curwen.

Watford.—Electricity Committee. Accepted. Two 250-kVA transformers (£375).—Met.-Vick. Electrical Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Extensions to factory, for Highams, Ltd., Woodnook Mills.

Acton.—Six shops and flats, High Street; T. Poore & Son, 230, High Street, W.3. Extension to factory, near Chase Road; Allnatt, Ltd., Chase Estate, Park Royal Road, N.W.10.

Addington.—Houses (14), Palace View; Bennett and Worksett.

Addiscombe.—Extensions to factory, Morland Road; L. H. Hounsfield.

Ashby-de-la-Zouch.—Houses; R.D.C. surveyor.

Buxton.—Houses (30), Earl Sterndale; W. Hodgkinson, builder, Earl Sterndale, near Buxton.

Barnard Castle.—Houses (54), for North-Eastern Housing Association, Ltd.; Wetherall, Dent & Pickersgill, architects, Lloyds Bank Chambers.

Barnsley.—Houses (22), Gawber Road; V. Dunk.

Bedlington.—Houses (74), Red House; W. Hall, U.D.C. surveyor.

Beeston (NOTTINGHAMSHIRE).—Houses (76), New Milford estate, Bramcote; A. H. Marshall, builder, "The Fire," Ilkeston Road, Bramcote.

Bishop Auckland.—Factory, for Cardinal Cabinets, Ltd.; J. R. Rutherford and Sons, builders, Jesmond, Newcastle-on-Tyne. Rebuilding of factory, St. Helen's estate, after fire; H. E. Pitt, Ltd., builders, Leopold Street, Millfield, Sunderland.

Blackpool.—Houses (14), Hathaway; H. Eckersley. Biscuit factory, Vicarage Lane; Burton's Biscuits, Ltd. Cinema, Bloomfield Road; J. Lord. Cinema, Promenade; Hinchcliffe & Roper.

Boldon (Co. DURHAM).—Greyhound racing stadium for Young and Hedley; Marshall, Tweedy and Bourn, architects, Grainger House, 36, Blackett Street, Newcastle-on-Tyne.

Boston.—Houses (58); R.D.C. surveor.

Bradford.—Extensions to St. Patrick's R.C. schools (£16,000); S. Simpson, architect, Cookridge Street, Leeds.

Brighton.—Development of Rottingdean Gardens estate; O. C. Selbach.

Brockworth.—Flats (316), Ermin Road; L. W. Barnard & Partners, architects, Imperial Square, Cheltenham.

Chapel-en-le-Frith.—Houses (16), near Brooklands Road; A. Morten, Macclesfield Road, Burbage.

Chepping Wycombe.—School (£56,070), for the E.C.

Chester.—Houses (48), Sedgley Road; E. R. Gorst.

Cockermouth (CUMBERLAND).—Houses (50), for the U.D.C.; R. A. C. Simpson, architect, John Street, Workington.

Crewe.—Houses (67), near Valley Road; Bainsbridge Bros.

Devonshire.—School, Honiton (£34,956), for the County E.C.

Durham.—School, East Hedley Hope, for the County Council; F. Willey, 34, Old Elvet, Durham City.

Edinburgh.—Houses (382), Granton district, for the Corporation; city architect.

Falkirk.—Nurses' home, for the Falkirk and District Infirmary (£40,000); Rowand, Anderson & Paul, architects, Rutland Square, Edinburgh.

Felling-on-Tyne.—Houses (14), Coldwell Park estate; N. T. Barker, builder, Winlaton, Co. Durham.

Gateshead.—Houses (68), Old Fold, for the T.C.; borough engineer. Houses and shops, Durham Road, for T. Hepple; Arthur and Kirkup, architects, 13, Swinburne Street. Drill hall, Alexandra Road, for the Royal Artillery; Mauchlen and Weightman, architects, 12, Saville Row, Newcastle-on-Tyne.

Glamorganshire.—Extensions to mining institutes, Bridgend and Neath (£26,500 each), for the E.C.; county architect, County Hall, Cardiff.

Gillingham.—Extensions to factory, for Novadel, Ltd., Pier Road.

Glasgow.—Houses (24), Wyndford estate; Housing director and trade contractors. Offices (£70,000), West Nile Street, for Law Union and Rock Insurance Co., Ltd.; Wylie, Shanks & Wylie, architects, 204, West Regent Street. Extensions to Crookston Homes (£27,000); city engineer. Extensions to Zenith works, Thornliebank; Henry Wiggin & Co., Ltd.

Glendale (NORTHUMBERLAND).—Houses (22); Hetherington and Wilson, architects, County Chambers, Newcastle-on-Tyne.

Gloucester.—Swimming baths (£40,000); deputy town clerk.

Godstone.—Houses (52), Blindley Heath; S. Easter, R.D.C. surveyor.

Grangemouth.—Extensions to factory, for the Scottish Dyes, Ltd., Earl Road.

Hastings.—Rebuilding of Old Wesley Chapel, Bourne Street (£8,750); S. G. Scales, architect, 25, Goggard Road, Clive Vale.

Hereford.—Extensions to works, for Painter Bros., Ltd., Mortimer Road.

Hull.—Houses (210), Bilton Grange estate; city architect, Guildhall.

Kidderminster.—Development of Cairndhu estate; Taylor, Ltd. Extensions to works, Mills Street; Carpet Trades, Ltd.

Leicester.—Central omnibus station, Burley's Lane; city surveyor.

Liverpool.—Large extensions to store premises, London Road (£50,000), for J. Reubin, Ltd.; A. E. Shennan, architect, North House, North John Street.

London.—(DEPTFORD).—Tenements (150), Tanners Hill; L.C.C. architect, County Hall. (KENSINGTON).—Flats, Notting Hill estate; borough engineer. (LAMBETH).—Large extensions to factory, King Edward Walk, for Oakley & Co., Ltd.; Parr & Sons, architects, New Broad Street House, E.C.2. (POPLAR).—Extensions to bus depot, Fairfield Road; London Passenger Transport Board. (SOUTHWARK).—Redevelopment, Redcross Street area; Mitchell & Bridgewater, architects, 42, Bruton Place, W.1.

Manchester.—Houses (24), Homewood Road, &c., Northenden; D. Kenyon, Ltd., 51, Hildas Road, Northenden. Houses, Woodhouse Lane and Brownley Road, Northen Etchells, for J. E. France; Leech & Ratcliffe, architects, 7, Cheapside.

Middlestone Moor (Co. DURHAM).—Houses (44), for the North-Eastern Housing Association, Newcastle-on-Tyne; A. Elcoat and Sons, builders, Darlington Road, Durham.

Middleton.—Houses (26), Milton Street, Rectory Street and Market Street; P. Roydes & Co., builders, Heywood New Road.

Monmouthshire.—County General Hospital, Bryn, Pontllanfraith (£176,000), for the C.C.; county architect.

Musselburgh.—Houses (300), Linkfield Road, for the Corporation; burgh surveyor.

Newcastle (STAFFORDSHIRE).—Houses (22), Tittensor Road; H. Jones, 37, Higherland, Newcastle-under-Lyme.

Newcastle-on-Tyne.—Houses, Colwell Street, Benwell Hill Road, for Carr and Kirk, Ltd., and Angerton Gardens, for Seymour and Carrick; F. M. Dryden, architect, New Market Street. Houses (12), Robsheugh Place; Hadden and Hillman, builders, Huddlestone Street. Houses (150), and shops, Wesley Street area; city architect, 18, Cloth Market. Dance hall (£5,000); Social Entertainments, Ltd., promoters, 15, New Bridge Street. Shops and offices, Bentick Crescent; Jackson & Sons, contractors, Corporation Street. Extensions to King's College, College Road (£90,000); W. B. Edwards, architect, 52, Eldon Place.

Norbury.—Houses (28), Station estate; B. G. Utting & Co., Ltd.

Northern Ireland.—(BELFAST).—New factory, for R. Atkinson & Co., Dublin. Extensions to Purdysburn Fever Hospital (£131,400), for T.C.

Nottingham.—Houses (438), Broxtowe Lane estate; E. Phillips, housing architect, Exchange Buildings East.

Poole.—Remodelling of Isolation Hospital (£50,000); borough surveyor.

Port Talbot.—Rebuilding of Capitol Cinema (£20,000), and rebuilding Empire Theatre (£17,000), for Portavon Cinema Co.; W. Wort, architect, 15, Windsor Place, Cardiff.

Rugby.—Houses (180), Dunchurch Road; Browning Bros., builders, Main Street, Humberstone, Leicester.

Ruislip.—Houses (24), Breakspear Road; H. R. Metcalfe, U.D.C. surveyor.

Sheffield.—Cinema, Parsons Cross estate, for B. Gregory. Extensions to Cathedral (£50,000); Sir Charles Nicholson, architect, New Square, Lincoln's Inn, London, W.C.2.

Shropshire.—School, Whitchurch, for the County Council. E. Taylor & Co., Ltd., builders, Ebor Saw Mills, Littleborough, Lancashire.

Southall.—Extensions (£10,000), Southall-Norwood Hospital; Bostock & Hollins, architects, 4, South Road, Southall.

Stockport.—Confectionery works near Eastcoate Road and Newark Road, South Reddish, for the Co-operative Wholesale Society, Ltd., Balloon Street, Manchester; Building Department, Co-operative Wholesale Society, Ltd., Vere Street, Salford.

Stockton-on-Tees.—Houses, &c., near Tanners Bank; E. Benjamin, builder, Billingham Road, Norton.

Sunderland.—Infant welfare clinic; J. E. Lewis, borough engineer. School, Chester Road; E.C.'s architect, John Street. Extensions to Havelock schools, for the E.C. (£35,000); Randle and Co., builders, Back Dunelm Street.

Warwick.—Houses (95), Cubbington, Bishop's Tachbrook and Bubbenhall; F. P. Trepess & Son, architects, 1, Church Street, Warwick.

Washington (Co. DURHAM).—Houses (60); T. Broome, surveyor.

Welwyn Garden City.—Hotel and restaurant (£15,000), Mill Green Lane; Welwyn Builders, Ltd., Welwyn Garden City.

Whitby.—Houses (20), Castle Park; R. A. Wilson and Son, builders, Whitby. Houses (36), Staithes Lane End; W. Barker, Greylands Farm, Hinderwell.

Wolverhampton.—Houses (54), Mason Crescent; G. W. Yates. School, Prestwood Road (£38,486); A. M. Griffiths & Son, Ltd. Extensions to works, Upper Villiers Street; Contactor Switchgear, Ltd.

Worksop.—Houses (37), Gateford Road estate; C. E. Coggan, Gateford Road.

Yaxley.—Houses (264); Goodwill & Pywell, Broadway.